N72-10935 (NASA-CR-120004) SPACE SHUTTLE: STATIC STABILITY AND CONTROL INVESTIGATION OF THE NR-GD/C DELTA WING BOOSTER (B-15B-1) AND A REUSABLE NUCLEAR STAGE (RNS) M E.C. Allen
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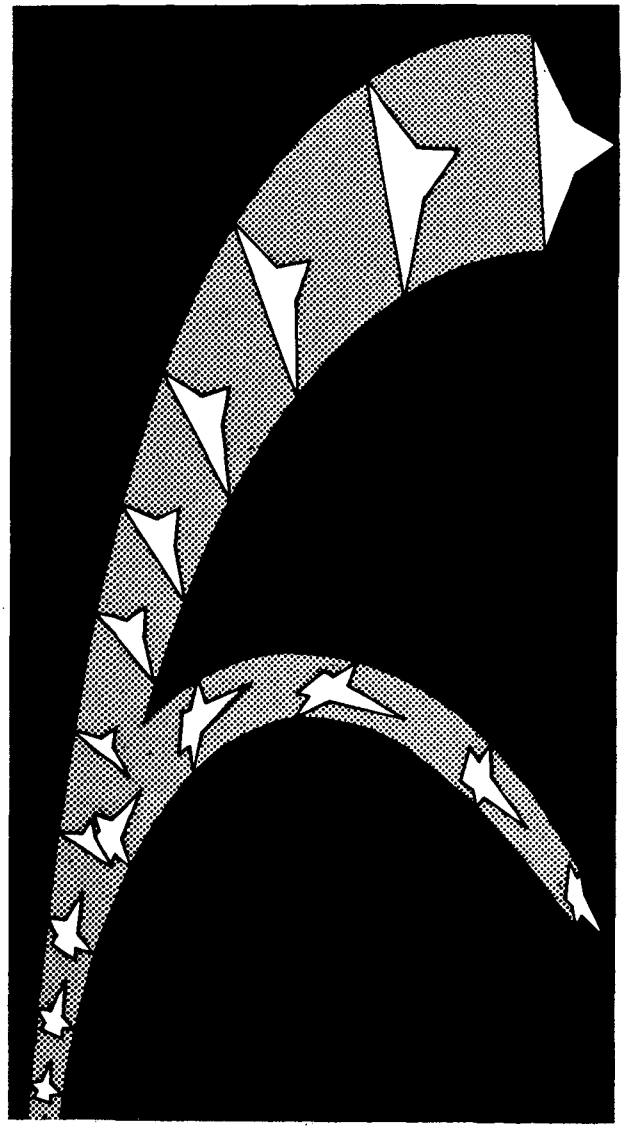

—SPACE SHUTTLE—

A STATIC STABILITY AND CONTROL INVESTIGATION OF THE NR - GD/C DELTA WING BOOSTER (B-15B-1) AND A REUSABLE NUCLEAR STAGE (RNS) M=0.6 - 4.96

by

E. C. Allen, NR

MSFC 14 - INCH
TRISONIC WIND TUNNEL

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MARSHALL SPACE FLIGHT CENTER

SPACE DIVISION CHRYSLER CORPORATION

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SPACE FLIGHT CENTER

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SADSAC/SPACE SHUTTLE

WIND TUNNEL TEST DATA REPORT

CONFIGURATION: NR-GD/C-0.0031 Scale Delta Wing Booster (B-15B-1) and Reuseable Nuclear Stage (RNS)

TEST PURPOSE: Static Stability and Control Investigation

TEST FACILITY: NASA/MSFC 14 x 14 Inch Trisonic Wind Tunnel

TESTING AGENCY: North American Rockwell

TEST NO. & DATE: MSFC 497, 7/1/71 - 7/2/71

FACILITY COORDINATOR: Jim Weaver (MSFC)

PROJECT ENGINEER(S): E. C. Allen (NR)

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CONTRACT NAS 8-4016 AMENDMENT 154 DRL 184 - 58

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ABSTRACT

Experimental aerodynamic investigations were made in the NASA/MSFC 14 x 14 inch Trisonic Wind Tunnel on a NR-GD/C 0.0031 scale model delta wing booster (B-15B-1) and reuseable nuclear stage (RNS). Three basic configurations were tested (1) the B-15B-1 booster alone, (2) the RNS alone, and (3) the booster with the RNS mounted "piggyback". Six component force and moment data were recorded for each of these configurations over an angle of attack range from -16° to 4° at zero degrees sideslip, and over an angle of sideslip range from -10° to 10° at zero and -6 degrees angle of attack. The configurations were tested over a Mach Number range of 0.6 to 5.0 with a nominal Reynolds number of 6.5×10^{6} per foot except for Mach 1.2 and 3.0 where the Reynolds numbers were 12.4×10^{6} and 4.4×10^{6} per foot respectively.

In addition to the basic configuration runs, various control surface (elevon, aileron, and rudder) deflections were also investigated.

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SUMMARY

Experimental aerodynamic investigations were made in the NASA/MSFC 14 x 14 inch Trisonic Wind Tunnel on a NR-GD/C 0.0031 scale model delta wing booster (B-15B-1) and reuseable nuclear stage (RNS). Three basic configurations were tested (1) the B-15B-1 booster alone, (2) the RNS alone, and (3) the booster with the RNS mounted "piggyback". Six component force and moment data were recorded for each of these configurations over an angle of attack range from -16° to 4° at zero degrees sideslip, and over an angle of sideslip range from -10° to 10° at zero and -6 degrees angle of attack. The configurations were tested over a Mach Number range of 0.6 to 5.0 with a nominal Reynolds number of 6.5×10^{6} per foot except for Mach 1.2 and 3.0 where the Reynolds numbers were 12.4×10^{6} and 4.4×10^{6} per foot respectively.

In addition to the basic configuration runs, various control surface (elevon, aileron, and rudder) deflections were also investigated.

CONFIGURATIONS INVESTIGATED

The following model components were tested either individually or in various combinations.

RNS - reuseable nuclear stage.

B_{19} - basic body for booster B-15B-1, includes eight peripheral rocket engines and fairings

W_{14} - basic delta wing with an unswept T.E., a 4° twist, and a 3° dihedral.

C_{4A} - basic canard for B-15B-1 booster.

V_7 - basic vertical tail for the B-15B-1 booster.

The dataset collation sheets give the various combinations of the components tested. Pertinent dimensional data for each component can be found in the Model Component Description Sheets which follow the figures. Sketches and photographs of the model and model components are shown in Figures 2 through 9.

TEST TWT-497 DATA SET COLLATION SHEET

Force - Reuseable Nuclear Stage + Booster and Booster Alone
0.0031 - Scale - Stability and Control

☐ PRETEST
☒ POSTTEST

DATA SET IDENTIFIER	CONFIGURATION	SCHD. α	SCHD. β	CONTROL DEFLECTIONS δE_L	δE_R	δR	GRIT	NO. of RUNS	MACH NUMBERS 0.6	0.95	1.0	1.2	2.99	4.96
R3901A	819W14C4AV7	A	0	0	0	0	OFF	6	024/0	019/0	018/0	017/0	015/0	016/0
02A		↓	↓				ON	6	001/1	002/0	003/0	004/0	012/0	011/0
01B		-6	B				OFF	6	024/0	023/0	022/1	021/0	014/0	013/0
02B		↓	↓			↓	ON	6	008/0	007/0	006/0	005/0	010/1	009/0
03A		A	0	↓	↓	10		1				043/0		
04A		↓	↓	10	-10	↓		1				042/0		
05A		↓	↓	↓	↓	0		1				039/0		
06A		↓	↓		-20	↓		1				038/0		
06B		-6	B		↓	↓		1				035/0		
05B		↓	↓	↓	-10	↓		1				034/0		
04B		↓	↓	↓	↓	10		1				031/0		
03B		↓	↓	0	0	↓		1				030/0		
07B	+RNS	↓	↓	↓	↓	0		4	025/0	026/0	027/0	028/0		
07A		A	0	↓	↓	↓		4	048/0	047/0	046/0	045/0		
08A		↓	↓	10	-10	↓		1				040/0		
09A		↓	↓	↓	-20	↓		1				037/0		
10A		↓	↓	↓	-10	10		1				041/0		
11A		↓	↓	0	0	↓		1				044/0		
11B		-6	B	↓	↓	↓		1				029/0		
10B		↓	↓	10	-10	↓	↓	1				032/0		

1 7 13 19 25 31 37 43 49 55 61 67 75 76

KLM KN KY KBL KYN KAF KAB KPBI KPC KL | 1 0

COEFFICIENTS: → IDPVAR(1) | IDPVAR(2) | NDV

α or β SCHEDULES

αA = -16, -14, -12, -10, -8, -6, -4, -2, 0, 2, 4

βB = -10, -8, -6, -4, -2, 0, 2, 4, 6, 8, 10

TEST TWT-497 DATA SET COLLATION SHEET

Force - Reuseable Nuclear Stage + Booster, and RNS Alone, Stability and Control

☐ PRETEST
☒ POSTTEST

DATA SET IDENTIFIER	CONFIGURATION	SCHD. α	SCHD. β	CONTROL DEFLECTION δEL	δER	δR	GRIT	NO. of RUNS	MACH NUMBERS 0.6	0.95	1.0	1.2	2.99	4.96
R39 08B	BMNIGCAAV7+RNS	-6	B	10	-10	0	ON	1				033/0		
09B	↓	↓	↓	↓	-20	↓	↓	1				036/0		
12A	↓ $R_{e_{MAX}}$	A	0	0	0	↓	↓	1				049/0		
13A	RNS ALONE	A	0	—	—	—	ON	4	53/0	52/0	51/0	50/0		
13B	↓	-6	B	—	—	—	↓	4	54/0	55/0	56/0	57/0		

1	7	13	19	25	31	37	43	49	55	61	67	75	76
CLM	CN	CY	CBL	CYN	CAF	CAB	CPB1	CPC	CL				1 0

COEFFICIENTS: IDPVAR(1) | IDPVAR(2) | NDV

α or β SCHEDULES

α A = -16, -14, -12, -10, -8, -6, -4, -2, 0, 2, 4

β B = -10, -8, -6, -4, -2, 0, 2, 4, 6, 8, 10

TEST FACILITY DESCRIPTION

The Marshall Space Flight Center 14" x 14" Trisonic Wind Tunnel is an intermittent blowdown tunnel which operates by high pressure air flowing from storage to either vacuum or atmospheric conditions. A Mach number range from .2 to 5.85 is covered by utilizing two interchangeable test sections. The transonic section permits testing at Mach 0.20 through 2.50, and the supersonic section permits testing at Mach 2.74 through 5.85. Mach numbers between .2 and .9 are obtained by using a controllable diffuser. The range from .95 to 1.3 is achieved through the use of plenum suction and perforated walls. Mach numbers of 1.44, 1.93 and 2.50 are produced by interchangeable sets of fixed contour nozzle blocks. Above Mach 2.50 a set of fixed contour nozzle blocks are tilted and translated automatically to produce any desired Mach number in .25 increments.

Air is supplied to a 6000 cubic foot storage tank at approximately $-40^{\circ}F$ dew point and 500 psi. The compressor is a three-stage reciprocating unit driven by a 1500 hp motor.

The tunnel flow is established and controlled with a servo actuated gate valve. The controlled air flows through the valve diffuser into the stilling chamber and heat exchanger where the air temperature can be controlled from ambient to approximately $180^{\circ}F$. The air then passes through the test section which contains the nozzle blocks and test region.

Downstream of the test section is a hydraulically controlled pitch sector that provides a total angle of attack range of 20° ($\pm 10^{\circ}$). Sting offsets are available for obtaining various maximum angles of attack up to 25°.

TEST CONDITIONS

Table I lists the tunnel conditions which prevailed during these tests and states the balance accuracies. (The #200 balance was utilized in the booster to record booster alone and booster with RNS loads; the #201 balance was utilized in the RNS during RNS alone runs only). With the exception of two series of runs (data sets R3901A and R3901B) all models utilized grit to fix flow transition. Grit patterns can be seen in Figures 2, 3 and 4. Model base and balance cavity pressures were measured and utilized to correct the balance measured axial force. The correction equations are given in the section on data reduction. Figures 12 and 13 show the base pressure orifice locations. RNS base pressures were recorded only during RNS alone runs and were used to correct only that data.

TABLE I
TEST CONDITIONS
TEST TWT-497

MACH NUMBER	REYNOLDS NUMBER per unit length	DYNAMIC PRESSURE (pounds/sq. inch)	STAGNATION TEMPERATURE (degrees Fahrenheit)
0.6	6.5×10^6	5.58	97
0.95	6.8×10^6	8.18	97
1.0	6.7×10^6	8.33	98
1.2	6.6×10^6	8.98	97
1.2	12.4×10^6	16.60	93
2.99	4.4×10^6	4.95	98
4.96	6.1×10^6	3.40	99

BALANCE UTILIZED: TWT Model 200 and 201 Moment Balances

	CAPACITY: 200	201	ACCURACY:	COEFFICIENT TOLERANCE:
NF	175 lbs	60 lbs		0.3%
SF	150 lbs	20 lbs		0.3%
AF	100 lbs	30 lbs		0.3%
PM	185 in.lbs	60 in.lbs		0.3%
YM	160 in.lbs	20 in.lbs		0.3%
RM	50 in.lbs	25 in.lbs		0.3%

COMMENTS:

No satisfactory method is known for determining the absolute accuracy of the final data coefficients.

DATA REDUCTION

The aerodynamic forces and moments measured by the balance were first corrected for weight tares, base and balance cavity pressures, and then reduced to coefficient form in the body axis system utilizing the reference values of Table II. The axial force correction equations utilized were:

$$C_{AF} = C_A - (C_{AB} + C_{AC})$$

where

$$C_{AB} = - \left[(p_{b_1} - p_\infty) A_{b_1} + (p_{b_2} - p_\infty) A_{b_2}\right]/q_\infty S_{REF}$$

and

$$C_{AC} = - \left[(p_c - p_\infty) A_c\right]/q_\infty S_{REF}$$

TABLE II

MODEL REFERENCE DIMENSIONS

SYMBOL	DESCRIPTION	BOOSTER ALONE AND BOOSTER + RNS	RNS ALONE
S_{ref}	Ref. Area	15.656 in^2	15.656 in^2
$\bar{c}$	M.A.C.	3.095 in.	3.095 in
b	Span	6.099 in.	6.099 in.
$X_{c.g.}$*	Center of Gravity (Fuselage Station)	0.0 in. (Booster Nose)	1.561 in. (From RNS Nose)
$Y_{c.g.}$*	Center of Gravity	0.0 in.	0.0
$Z_{c.g.}$*	Center of Gravity (Water Line)	0.0 in.	1.332 in.
ℓ_B	Body Length	9.734 in. (B Nose to Wing T.E.)	8.306 in.
A_{b1}	Base Area (Upper Half)	0.418 in^2	.3655 in^2
A_{b2}	Base Area (Lower Half)	0.634 in^2	.3655 in^2
A_c	Balance Cavity Area	0.785 in^2	.454 in^2

* See Figures 10 & 11

TABLE III. SADSAC NOMENCLATURE OF AERODYNAMIC COEFFICIENTS

COEFFICIENT	COEFFICIENT NAME	SADSAC NOMENCLATURE		
		BODY AXIS	STABILITY AXIS	WIND AXIS
C_A	Total Axial Force	CA	-	-
C_{AB}	Base Axial Force	CAB	--	-
C_{AF}	Forebody Axial Force	CAF	-	-
C_D	Total Drag Force	-	CD	CDTOTL
C_{DB}	Base Drag Force	-	CDB	CDBASE
C_{DF}	Forebody Drag Force	-	CDF	CDFORE
C_L	Lift Force	-	CL	CL
C_N	Normal Force	CN	-	-
C_Y	Side Force	CY	CY	CC
C_ℓ	Rolling Moment	CBL	CSL	CWL
C_m	Pitching Moment	CLM	CLM	CPM
C_n	Yawing Moment	CYN	CLN	CLN
L/D	Lift-To-Drag Force Ratio	-	L/D	CL/CD
L/D	Lift-To-Forebody Drag Force Ratio	-	L/DF	CL/CDF
N/A	Normal-To-Axial Force Ratio	N/A	-	-
N/A	Normal-To-Forebody Axial Force Ratio	CN/CAF	-	-

SUMMARY DATA PLOT INDEX

TITLE	PLOTTED COEFFICIENTS SCHEDULE	CONDITIONS VARYING	PAGES
Effect of Grit In Pitch, Booster Alone	A	Grit, Mach	1-18
Effect of Grit In Yaw, Booster Alone	B	Grit, Mach	19-30
Elevon Effectiveness In Pitch, Booster Alone	C	Elevator, Aileron	31-36
Elevon Effectiveness In Pitch, Booster Plus RNS	C	Elevator, Aileron	37-42
Effect of RNS On Elevon Effectiveness, Pitch	C	Configuration, Elevator, and Aileron	43-60
Elevon Effectiveness In Yaw, Booster Alone	D	Grit, Elevator, and Aileron	61
Elevon Effectiveness In Yaw, Booster Alone	E	Elevator, Aileron	62-67
Elevon Effectiveness In Yaw, Booster Plus RNS	E	Elevator, Aileron	68-74
Effect of RNS On Elevon Effectiveness, Yaw	D	Configuration, Grit	75
Effect of RNS On Elevon Effectiveness, Yaw	E	Configuration, Elevator, and Aileron	76-95
Rudder and Elevon Effectiveness In Pitch, Booster Alone (Beta = 0)	C	Rudder, Aileron	96-101

SUMMARY DATA PLOT INDEX
(CONTINUED)

TITLE	PLOTTED COEFFICIENTS SCHEDULE	CONDITIONS VARYING	PAGES
Rudder and Elevon Effectiveness In Pitch, Booster Plus RNS (Beta = 0)	C	Rudder, Aileron	102-107
Effect of RNS On Rudder and Elevon Effectiveness (Beta = 0)	C	Configuration, Rudder, and Aileron	108-119
Rudder and Elevon Effectiveness In Yaw, Booster Alone	D, E	Rudder, Aileron	120-126
Rudder and Elevon Effectiveness In Yaw, Booster Plus RNS	E	Rudder, Aileron	127-133
Effect of RNS On Rudder and Elevon Effectiveness	E	Configuration, Rudder and Aileron	134-147
Effect of Angle of Attack, RNS Alone	A	Mach, Alpha	148-159
Effect of Angle of Sideslip, RNS Alone	F	Mach, Beta	160-175
Effect of Reynolds Number, Booster Plus RNS	A	Reynolds Number	176-178

PLOTTED COEFFICIENTS SCHEDULE:

(A) CN, CAF, & CLM vs. ALPHA

(B) CY, & CYN vs. BETA

(C) CN, CAF, CLM, CY, CYN, & CBL vs. ALPHA

(D) CBL vs. BETA

(E) CY, CYN, XCPY/L, CN, CAF, & CLM vs. BETA

(F) CY, CYN, CBL, & XCPY/L vs. BETA

F I G U R E S

Notes:

1. Positive directions of force coefficients moment coefficients, and angles are indicated by arrows.

2. For clarity, origins of wind and stability axes have been displaced from the center of gravity.

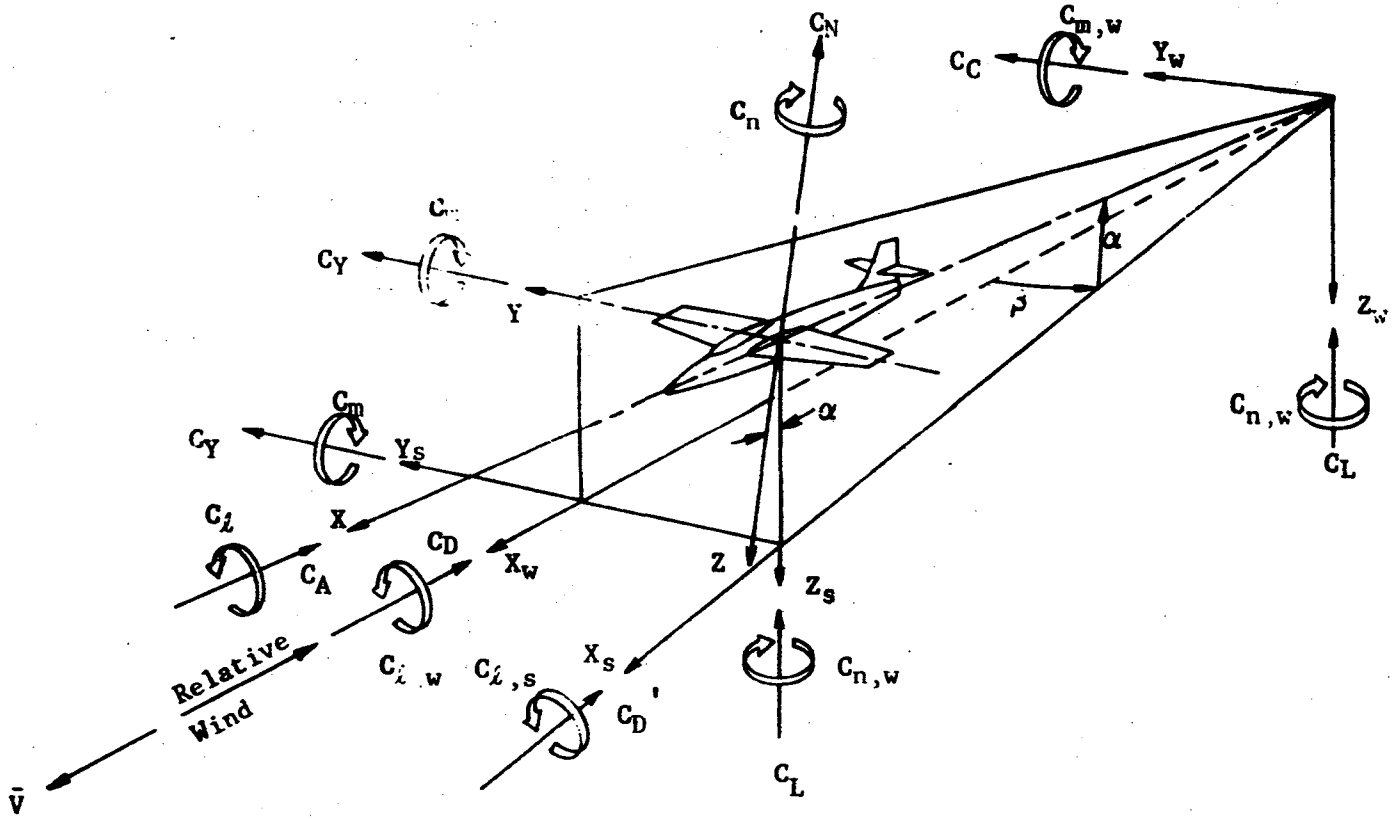

Figure 1. Axis systems, showing direction and sense of force and moment coefficients, angle of attack, and sideslip angle

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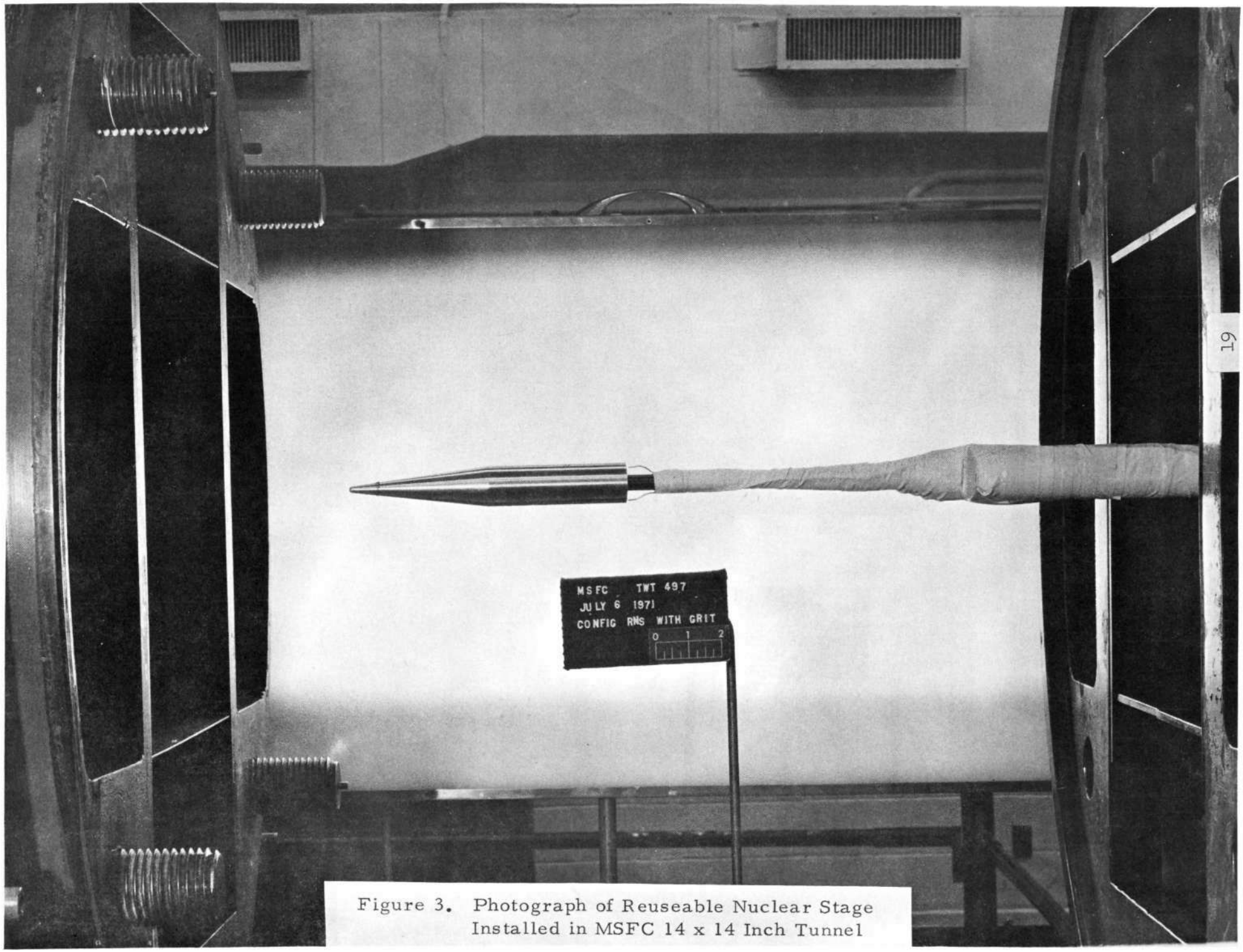


Figure 3. Photograph of Reuseable Nuclear Stage Installed in MSFC 14 x 14 Inch Tunnel

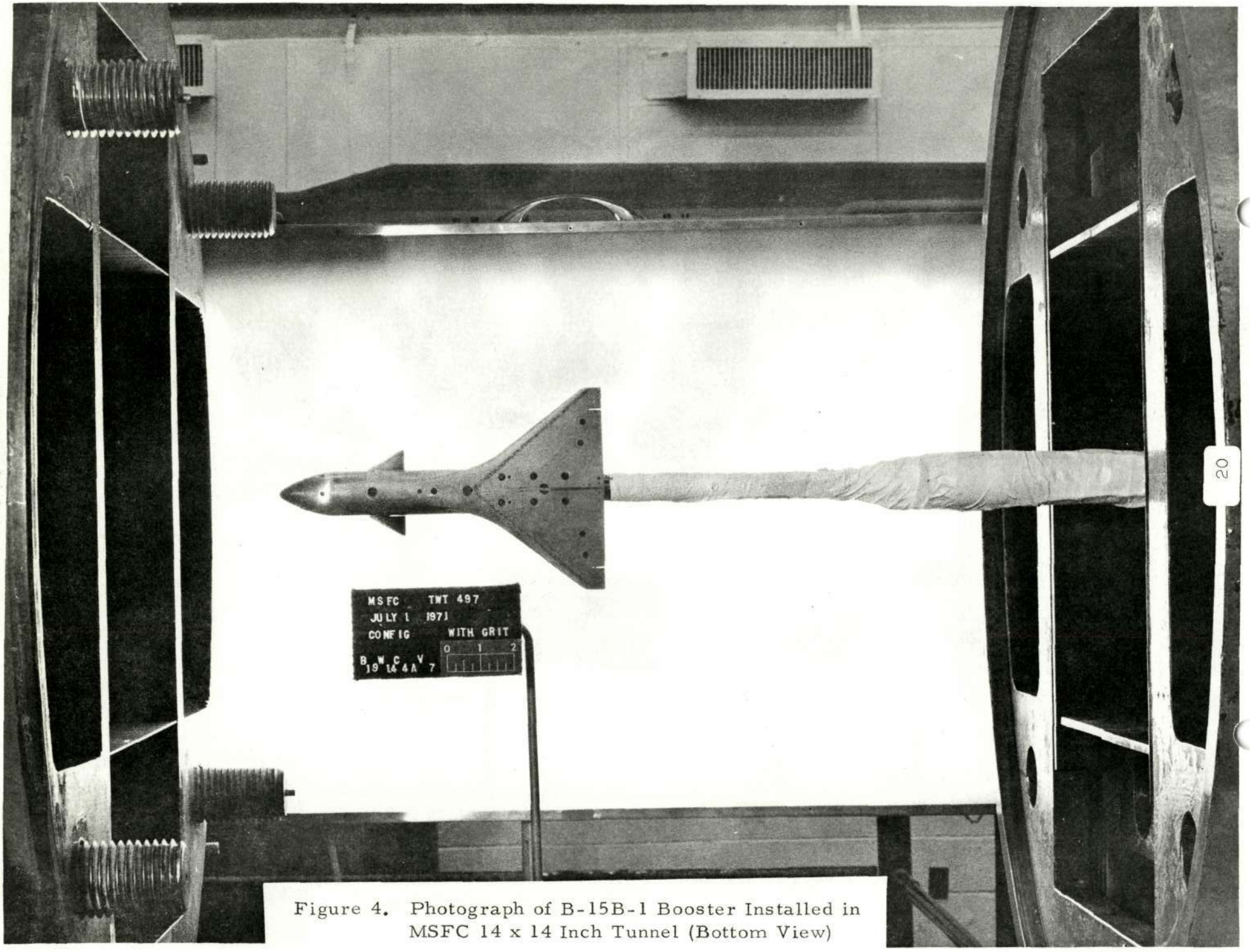
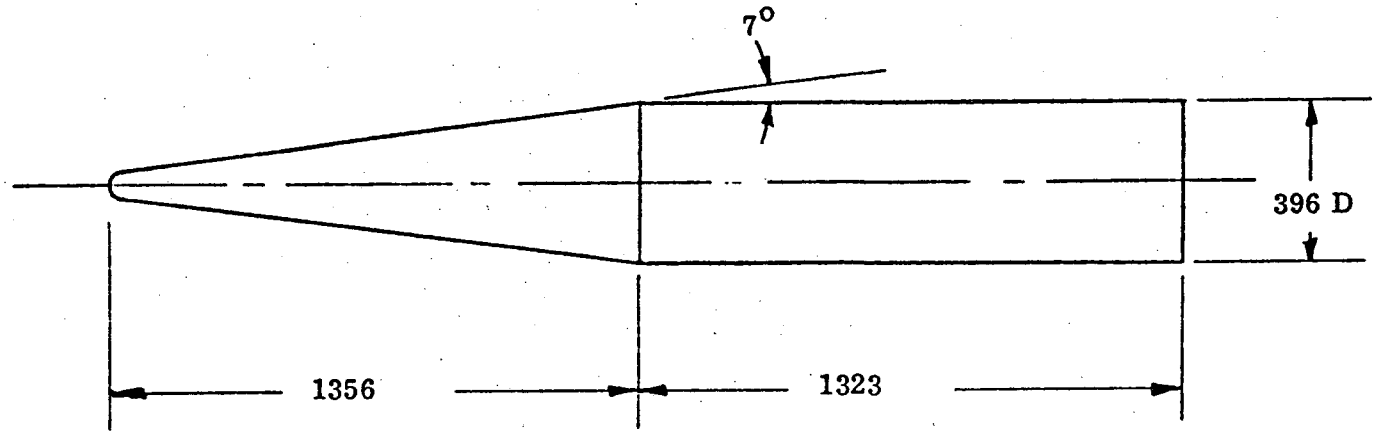


Figure 4. Photograph of B-15B-1 Booster Installed in MSFC 14 x 14 Inch Tunnel (Bottom View)



RNS

Figure 5. General Arrangement - Reuseable Nuclear Stage

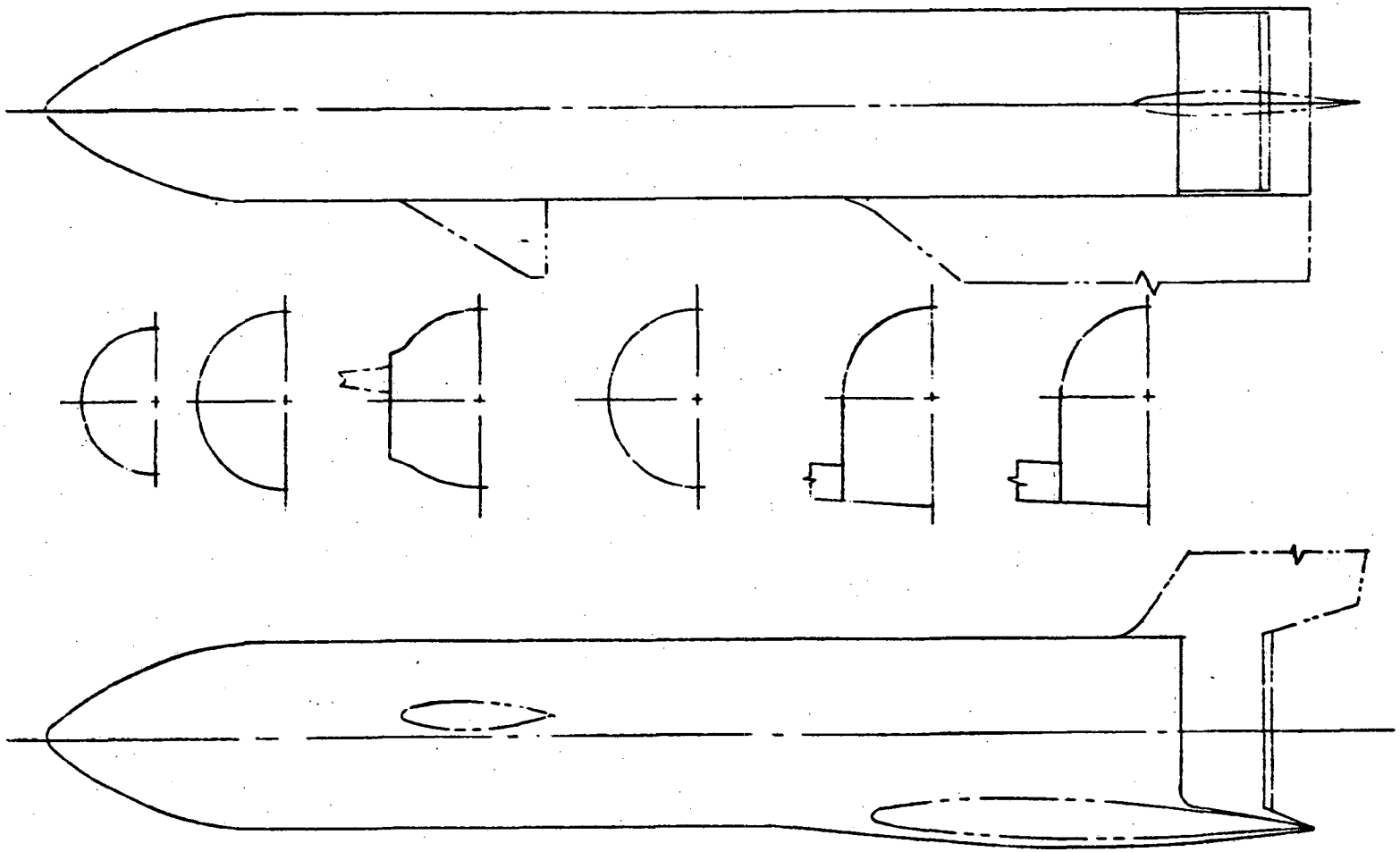


Figure 6. **BODY B19 - BOOSTER B-15 B-1 CONFIGURATION**

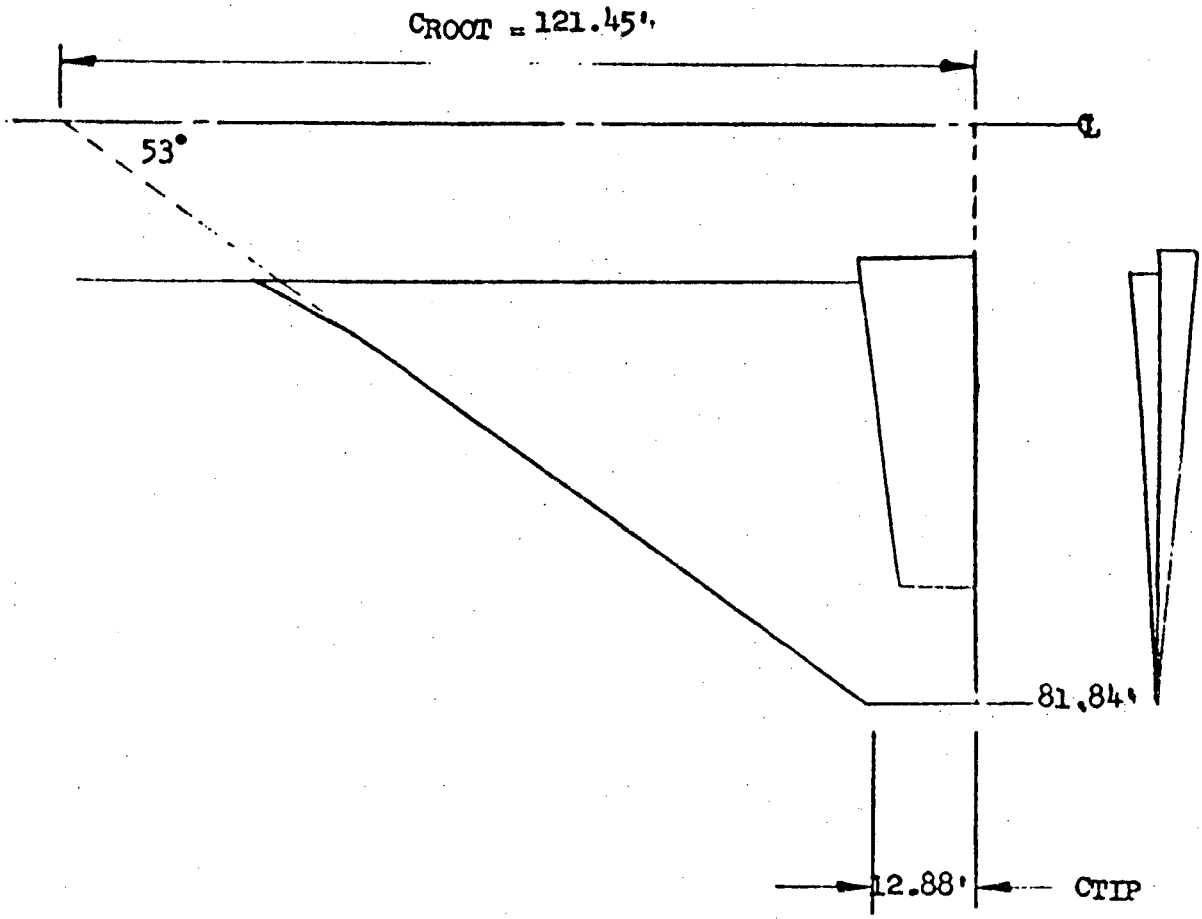


Figure 7. WING W14 - BOOSTER CONFIGURATION

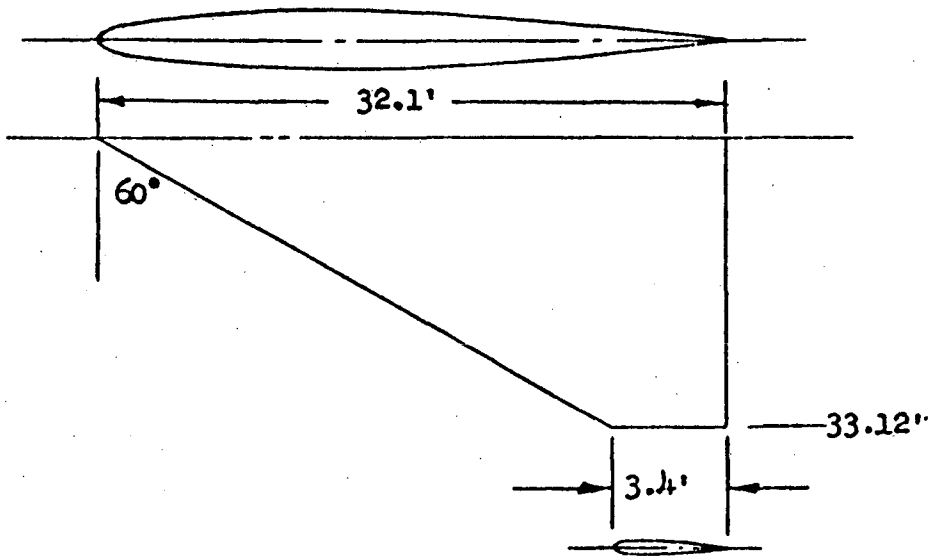


Figure 8. CANARD - C4

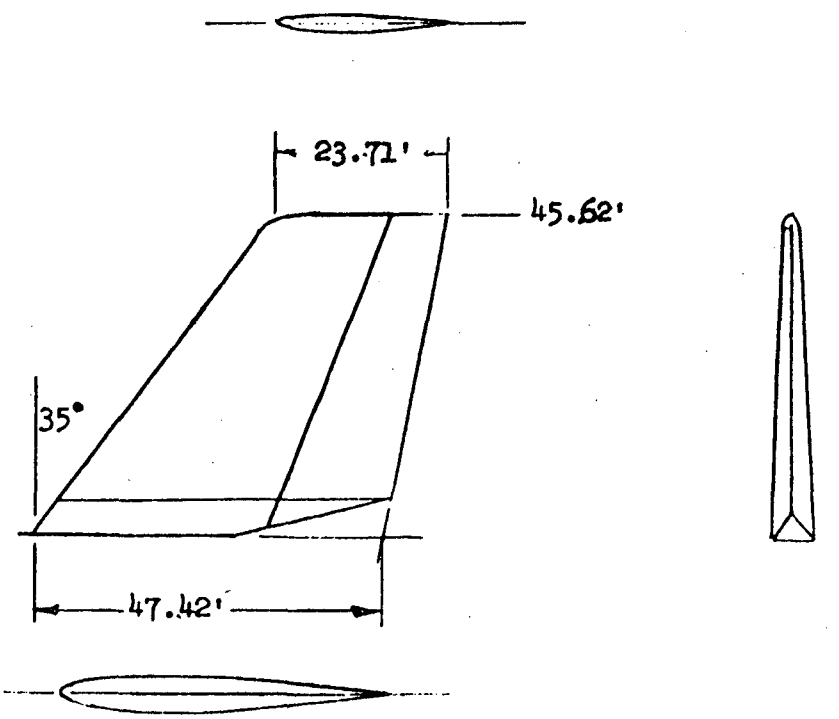


Figure 9. VERTICAL TAIL - V_7

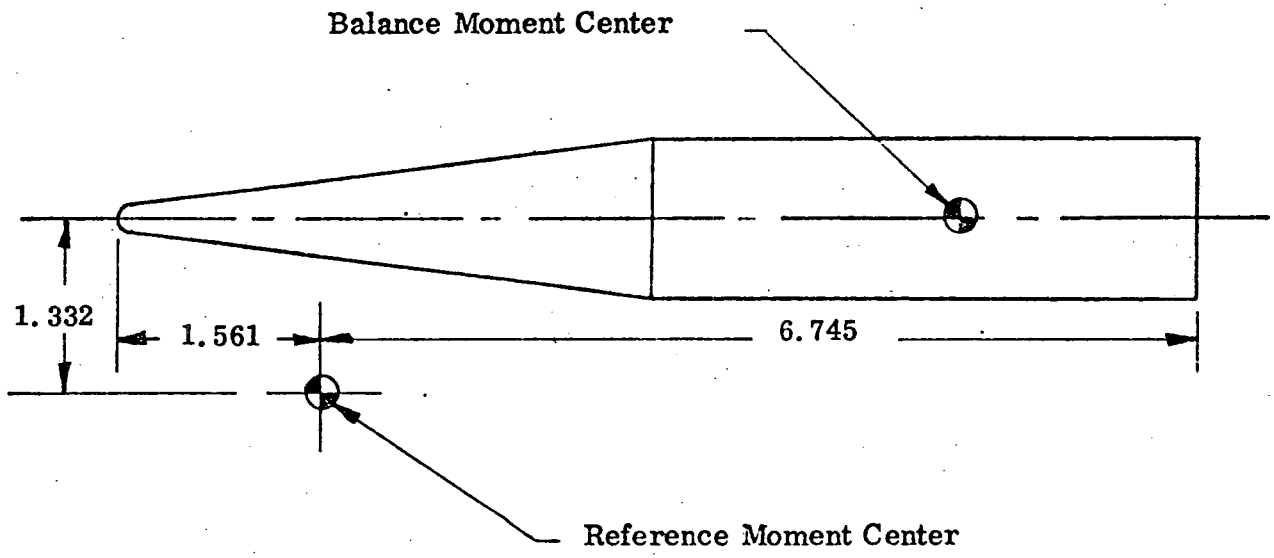


Figure 10. Reuseable Nuclear Stage Reference c.g. Location

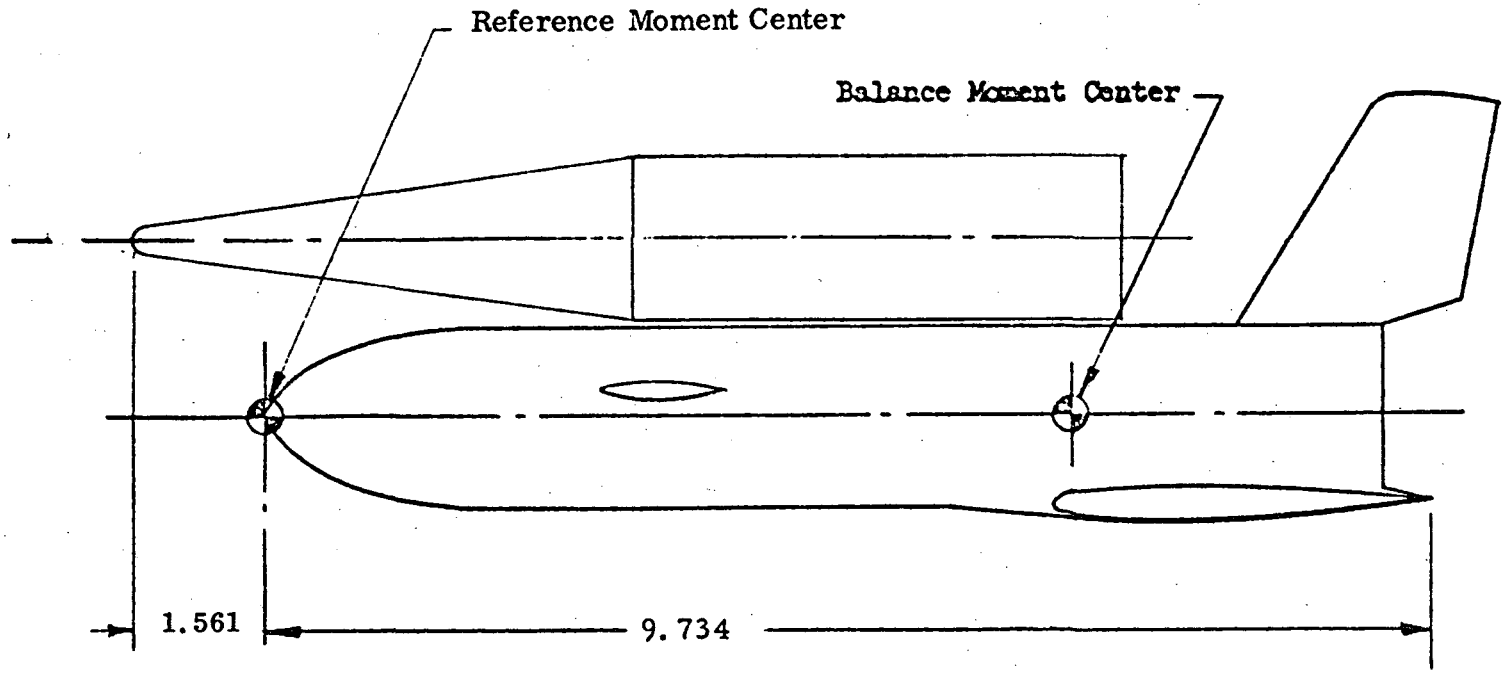
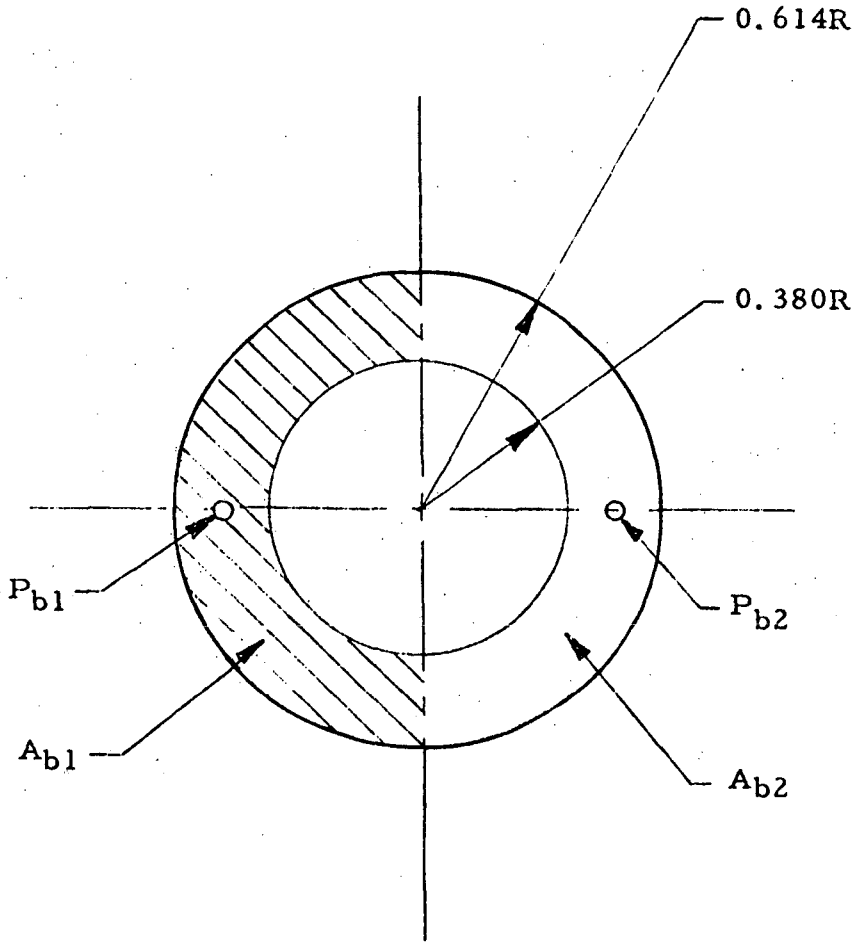
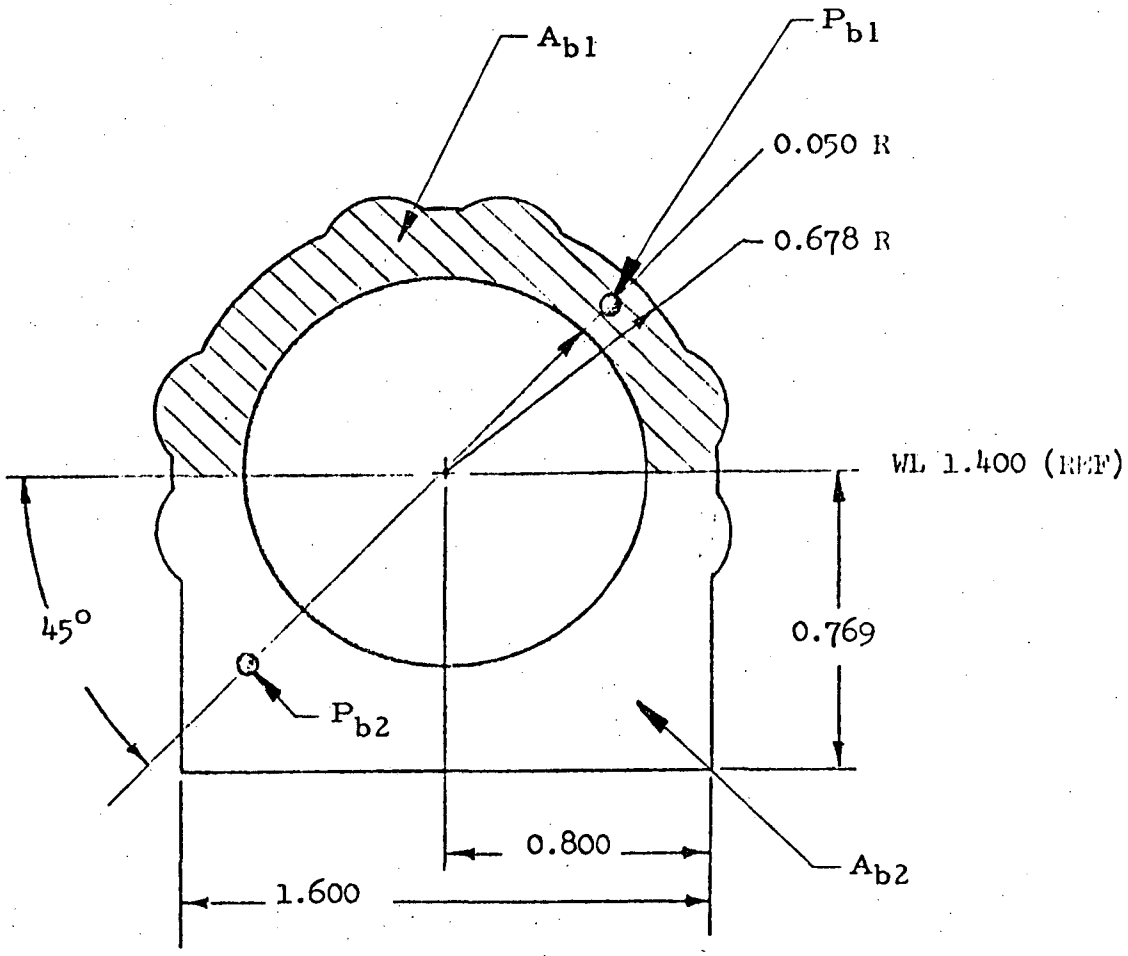


Figure 11. RNS Launch and Booster Alone Reference c.g. Location



Note: Location of pressure taps may vary slightly as installation will be made during test setup.

Figure 12. Location of Base Pressure Taps for RNS Alone.



View Looking Forward

NOTE: Location of pressure taps may vary slightly as installation will be made during test setup.

Figure 13. Location of Base Pressure Taps for Booster Alone and RNS Launch Configurations

MODEL COMPONENT DESCRIPTION SHEETS

TABLE IV

Reuseable Nuclear Stage

MODEL COMPONENT: BODY - RNS

GENERAL DESCRIPTION: Reuseable Nuclear Stage is a cone-cylinder body with a nose radius of 35.5 inches.

Model Scale: 0.0031

DRAWING NUMBER: 2244-202

DIMENSIONS:	FULL-SCALE	MODEL SCALE
Length, in.	2679	8.306
Max. Width, in.	396	1.228
Max. Depth, in.	396	1.228
Fineness Ratio		
Area		
Max. Cross-Sectional		
Planform		
Wetted		
Base		
Apex Angle (Cone), deg.	14	14

TABLE V

MODEL COMPONENT: BODY - B-19

GENERAL DESCRIPTION: Body for B-15B Delta Wing Configuration, with circular cross section at nose, fairing to flat bottom at wing. Flats on sides to close gap at canard root forward of hinge line. Fairings over rocket engines.

DRAWING NUMBER: WT-70-105222

DIMENSIONS:	FULL-SCALE	MODEL SCALE
Length (Nose to Wing T.E.)	2757	9.733
Max. Width	387	1.356
Max. Depth	453	1.587
Fineness Ratio	6.08	6.13
Area		
Max. Cross-Sectional	183837	2.252
Planform	1010612	12.501
Wetted		
Base	150028	1.840

TABLE VI

MODEL COMPONENT: WING - W_{14}

GENERAL DESCRIPTION: W_{10} modified to unswept trailing edge and with twist outboard of B. L. 340 linearly increasing to -4 degrees at tip and with leading edge faired into fuselage (W_{10} is the basic B-15B wing).

DRAWING NUMBER: WT-70-105222

DIMENSIONS:	FULL-SCALE	MODEL SCALE
TOTAL DATA		
Area		
Planform	1241959	15.656
Wetted		
Span (equivalent)	1739	6.099
Aspect Ratio	2.436	2.38
Rate of Taper		
Taper Ratio	0.106	0.1192
Diehedral Angle, degrees	3 at T.E.	3 at T.E.
Incidence Angle, degrees	2	2
Aerodynamic Twist, degrees	-4	-4
Toe-In Angle		
Cant Angle		
Sweep Back Angles, degrees		
Leading Edge	53	53
Trailing Edge	0	0
0.25 Element Line	44.85	44.85
Chords:		
Root (Wing Sta. 0.0)	1291	4.587
Tip, (equivalent)	137	0.547
MAC	869.4	3.095
Fus. Sta. of .25 MAC	3104.9	10.913*
W.P. of .25 MAC	219	0.766
B.L. of .25 MAC	136.9	1.126
Airfoil Section		
Root	NACA - 0010 - 64 (Mod)	
Tip	NACA - 0010 - 64 (Mod)	
EXPOSED DATA		
Area	812980	10.03
Span, (equivalent)	1373	4.743
Aspect Ratio	2.25	2.24
Taper Ratio	0.1306	0.1485
Chords		
Root	1048	3.684
Tip	137	0.547
MAC	709.1	2.504
Fus. Sta. of .25 MAC	3224.9	11.356*
W.P. of .25 MAC	222	0.624
B.L. of .25 MAC	438.6	1.572

* Fuselage stations are relative to an origin 3.500 inches ahead of the nose of B_{19}.

TABLE VII

MODEL COMPONENT: CANARD - C4A

GENERAL DESCRIPTION: Basic canard for the B-15B Delta Wing Configuration

DRAWING NUMBER: WT-70-105224

DIMENSIONS:	FULL-SCALE	MODEL SCALE
Area	66286	0.706
Span (equivalent)	352	1.232
Inb'd equivalent chord	341	1.061
Outb'd equivalent chord	36	0.099
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord		
At Outb'd equiv. chord		
Sweep Back Angles, degrees		
Leading Edge	60	57.68
Tailing Edge	0	0
Hingeline		
Area Moment (Normal to hinge line)		

Hinge Line Located at 25% of M.A.C. of Exposed Area

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TABLE VIII

MODEL COMPONENT: VERTICAL TAIL - V7

GENERAL DESCRIPTION: Basic vertical for B-15B delta wing configuration

DRAWING NUMBER: WT-70-105222

DIMENSIONS:	FULL-SCALE	MODEL SCALE
Area	177306	2.135
Span (equivalent)	485	1.674
Inb'd equivalent chord	504	1.723
Outb'd equivalent chord	252	0.826
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	0.35	0.35
At Outb'd equiv. chord		
Sweep Back Angles, degrees		
Leading Edge	35	36.40
Tailing Edge	10	11.29
Hingeline	19.83	19.83
Area Moment (Normal to hinge line)		

NOMENCLATURE

(General)

SYMBOL	SADSAC SYMBOL	DEFINITION
α	ALPHA	angle of attack, angle between the projection of the wind X_w-axis on the body X, Z-plane and the body X-axis; degrees
β	BETA	sideslip angle, angle between the wind X_w-axis and the projection of this axis on the body X-Z-plane; degrees
ψ	PSI	yaw angle, angle of rotation about the body Z-axis, positive when the positive X-axis is rotated toward the positive Y-axis; degrees
ϕ	PHI	roll angle, angle of rotation about the body X-axis, positive when the positive Y-axis is rotated toward the positive Z-axis; degrees
ρ		air density; K_g/m^3, slugs/ft^3
a		speed of sound; m/sec, ft/sec
V		speed of vehicle relative to surrounding atmosphere; m/sec, ft/sec
q	Q(PSI) Q(PSF)	dynamic pressure; $1/2\rho V^2$, psi, psf
M	MACH	Mach number; V/a
RN/L	RN/L	Reynolds number per unit length; million/ft
p		static pressure; psi
P		total pressure; psi
C_p	CP	pressure coefficient; $(p-p_\infty)/q$

NOMENCLATURE (Continued)

Reference & C. G. Definitions

SYMBOL	SADSAC SYMBOL	DEFINITION
S		wing area; m^2, ft^2
S	SREF	reference area; m^2, ft^2
$\bar{c}$		wing mean aerodynamic chord or reference chord; m, ft, in (see ℓ_{ref} or LREF)
ℓ_{ref}	LREF	reference length; m, ft, in.; (see $\bar{c}$)
b_{ref}	BREF	wing span or reference span; m, ft, in
A_b		base area; m^2, ft^2, in^2
c. g.		center of gravity
MRP	MRP	abbreviation for moment reference point
	XMRP	abbreviation for moment reference point on X-axis
	YMRP	abbreviation for moment reference point on Y-axis
	ZMRP	abbreviation for moment reference point on Z-axis

NOMENCLATURE (Continued)

Axis System General

SYMBOL	DEFINITION
F	force; F, lbs
M	moment; M, in-lb

Subscript	Definition
N	normal force
A	axial force
L	lift force
D	drag force
Y	force or moment about the Y axis
Z	moment about the Z axis
X	moment about the X axis
s	stability axis system
w	wind axis system
ref	reference conditions
∞	free stream conditions
t	total conditions
b	base

NOMENCLATURE (Continued)

Body Axis System

SYMBOL	SADSAC SYMBOL	DEFINITION
C_N	CN	normal force coefficient; F_N/qS
C_A	CA	axial force coefficient; F_A/qS
C_{A_b}	CAB	base axial force coefficient; $\left[-1\right] \left[(p_b - p_\infty)/q\right] (A_b/S)$
C_{A_f}	CAF	forebody axial force coefficient; $C_A - C_{A_b}$
C_m	CLM	pitching moment coefficient; $M_Y/qS\ \ell_{ref}$
C_y	CY	side force coefficient; F_Y/qS
C_n	CYN	yawing moment coefficient; $M_Z/qS\ b_{ref}$
C_ℓ	CBL	rolling moment coefficient, $M_X/qS\ b_{ref}$

NOMENCLATURE (Continued)

Surface Definitions

SYMBOL	SADSAC SYMBOL	DEFINITION
i_t	HORIZT	horizontal tail incidence; positive when trailing edge down; degrees
δ		symmetrical surface deflection angle; degrees; positive deflections are:
	AILRON	aileron - total aileron deflection; (left aileron - right aileron)/2
	CANARD	canard - trailing edge down
	ELEVON	elevon - trailing edge down
	ELEVTR	elevator - trailing edge down
	FLAP	flap - trailing edge down
	RUDDER	rudder - trailing edge to the left
	SPOILR	spoiler - trailing edge down
	TAB	tab - trailing edge down with respect to control surface
δ		antisymmetrical surface deflection angle, degrees; positive trailing edge down:
	AIL-L	left aileron - trailing edge down
	AIL-R	right aileron - trailing edge down
	ELVN-L	left elevon - trailing edge down
	ELVN-R	right elevon - trailing edge down
	SPLR-L	left spoiler - trailing edge down
	SPLR-R	right spoiler - trailing edge down

SURFACE SUBSCRIPTS	DEFINITION
a	aileron
b	base
c	canard
e	elevator or elevon
f	flap
r	rudder or ruddervator
s	spoiler
t	tail

ADDITIONS TO NOMENCLATURE

SYMBOL	SADSAC SYMBOL	DEFINITION
XCPY/L	XCPY/L	center of pressure location based on body length $\left(X_{cg} - \frac{CYN \cdot b_{ref}}{CY}\right)/\ell_B$
ℓ_B		body length

TABULATED DATA LISTING

A tabulated data listing, consisting of all aero data sets, both original and those created in arriving at the plotted material to be presented subsequently, is available as an addendum to this report. The tabular listing is made up in two sections:

(a) a brief summary list of all data sets containing the identifier, the descriptor, and the resident dependent variables.

(b) a full list of all data sets containing all resident or selected aerodynamic coefficients of the data sets as well as the above mentioned information.

The listing is currently sent on limited distribution to the following organizations:

NASA AMES	Mr. V. Stevens
NASA MSFC	Mr. Jim Weaver
NR	Mr. C. R. Leef

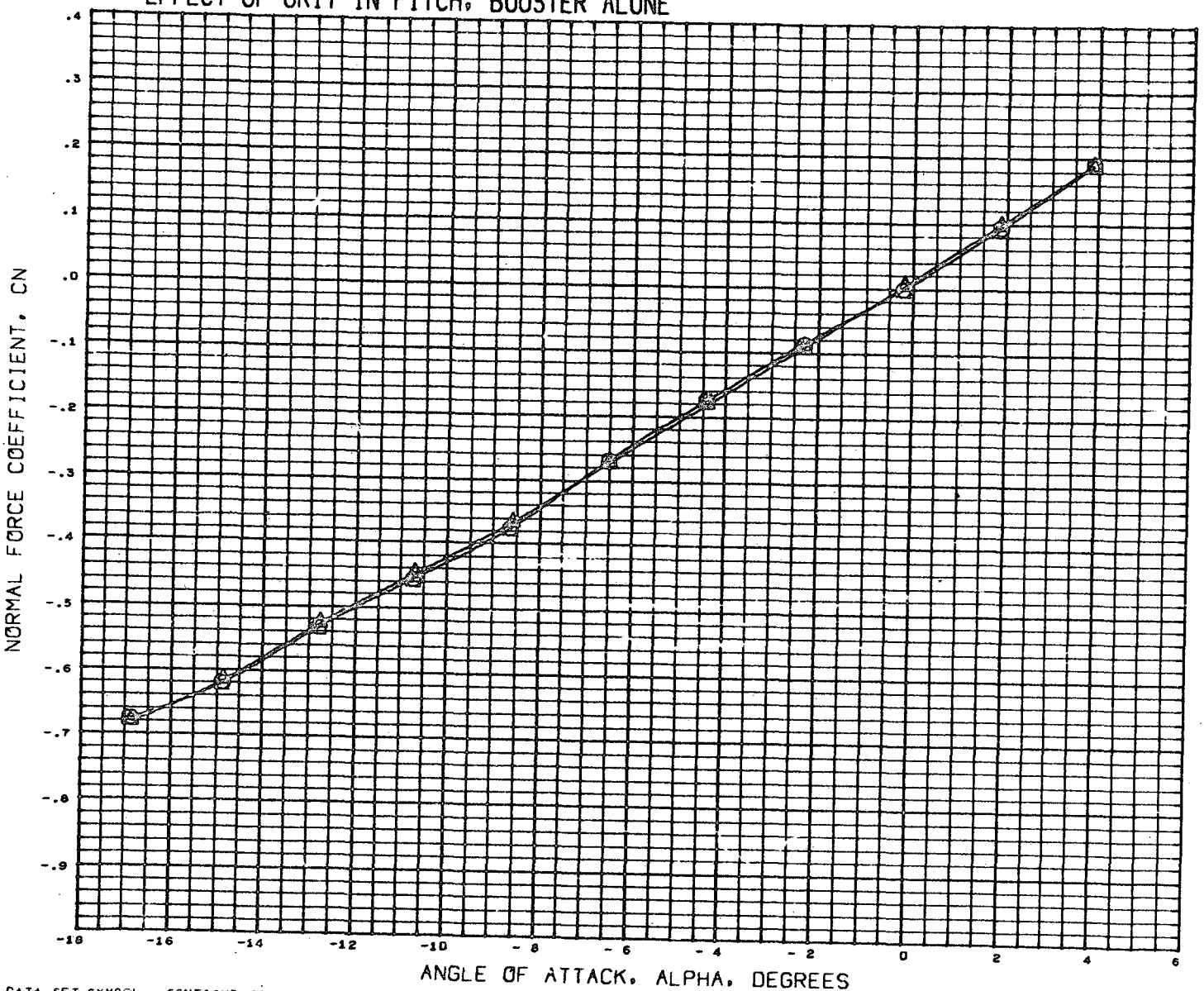
If copies of this listing are desired, please contact the above or the cognizant SADSAC personnel who, for this data, is:

Mr. John Hord
Department 2780
Chrysler Corporation Space Division
New Orleans, La. 70129

(504) 255-2304

P L O T T E D D A T A

EFFECT OF GRIT IN PITCH, BOOSTER ALONE



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(A3902A)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	0.000	54.000

MACH 0.597

REFERENCE INFORMATION

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BREF	6.0990	INCHES
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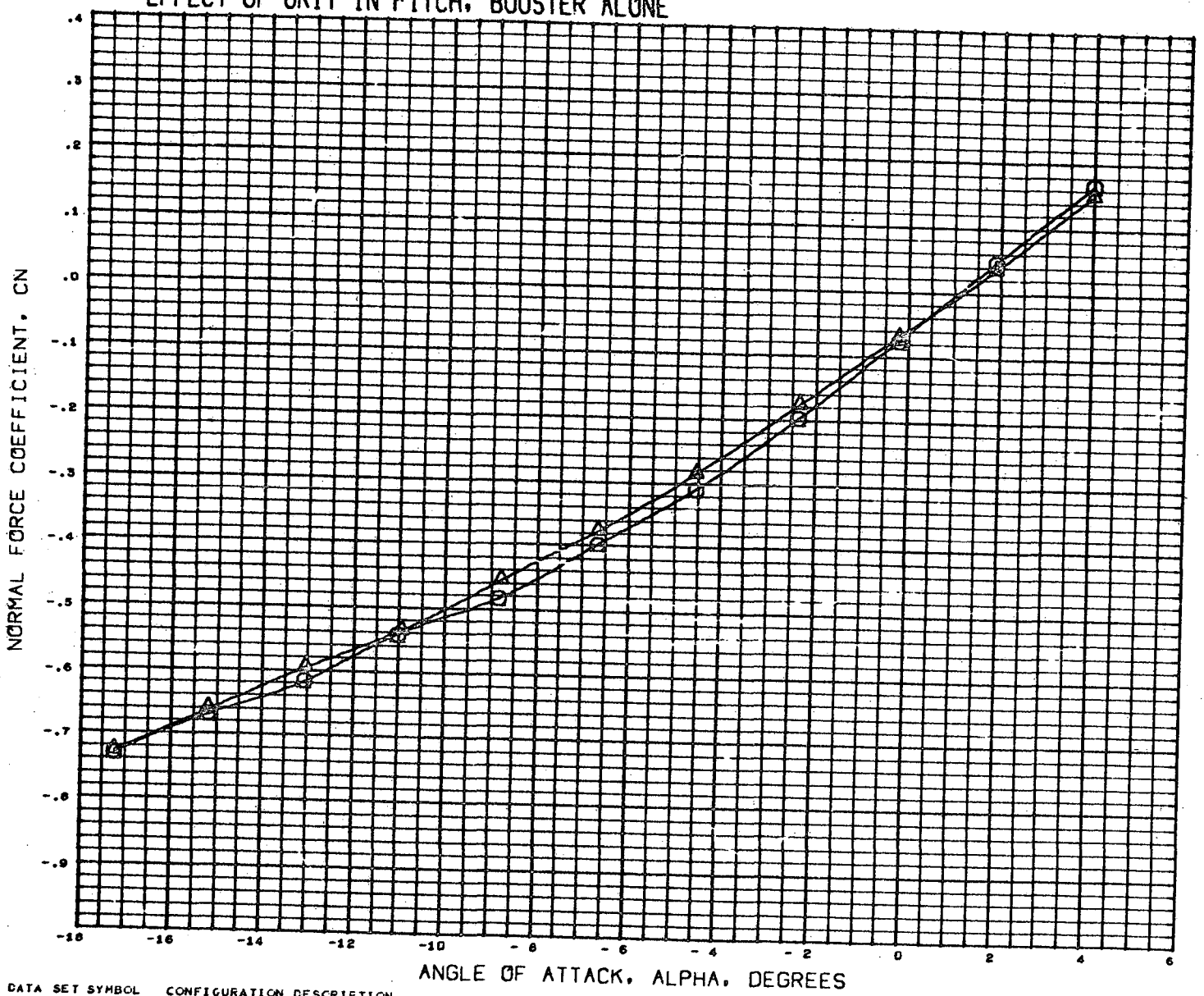
EFFECT OF GRIT IN PITCH, BOOSTER ALONE



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MACH 0.952

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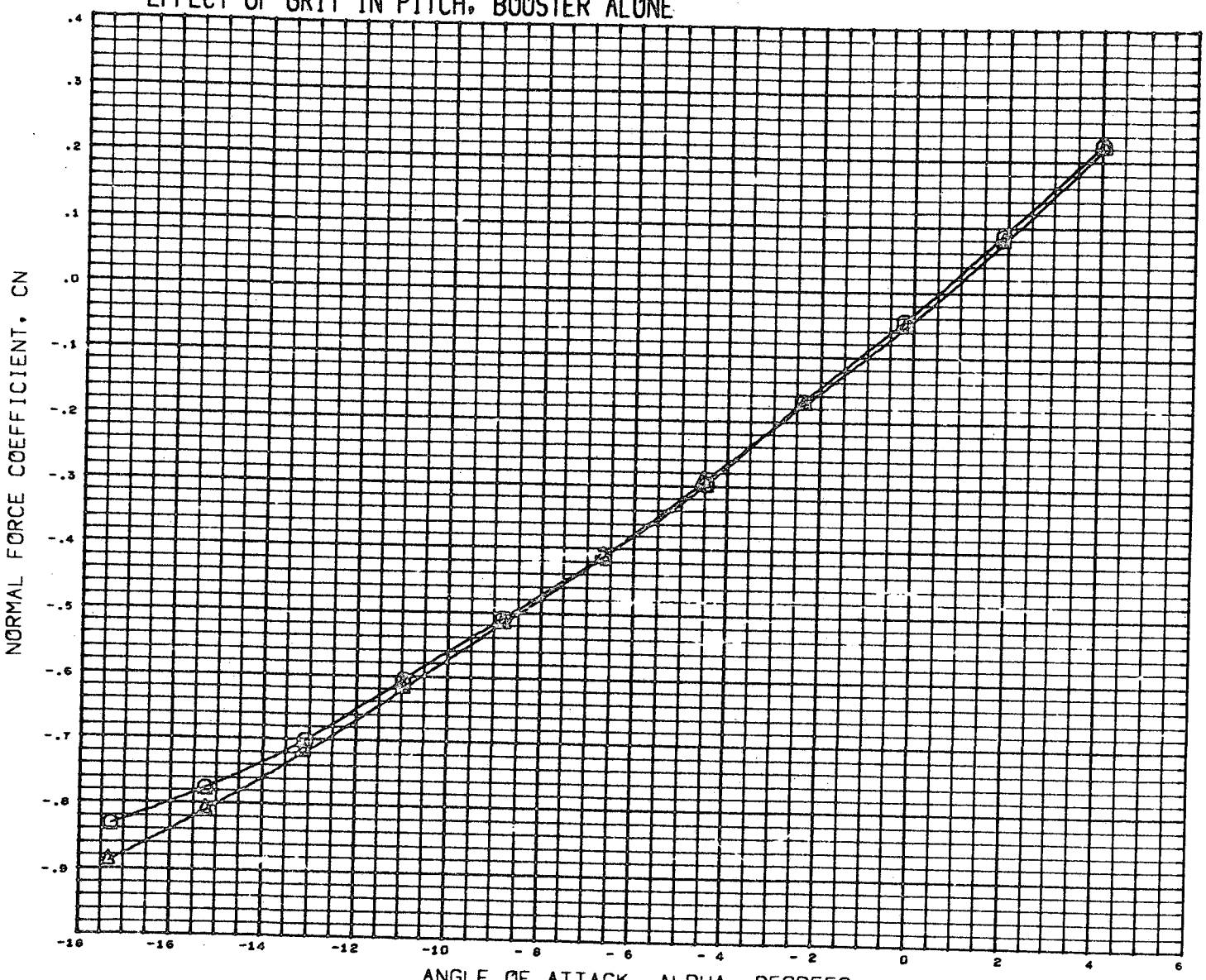
EFFECT OF GRIT IN PITCH, BOOSTER ALONE



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MACH 1.005

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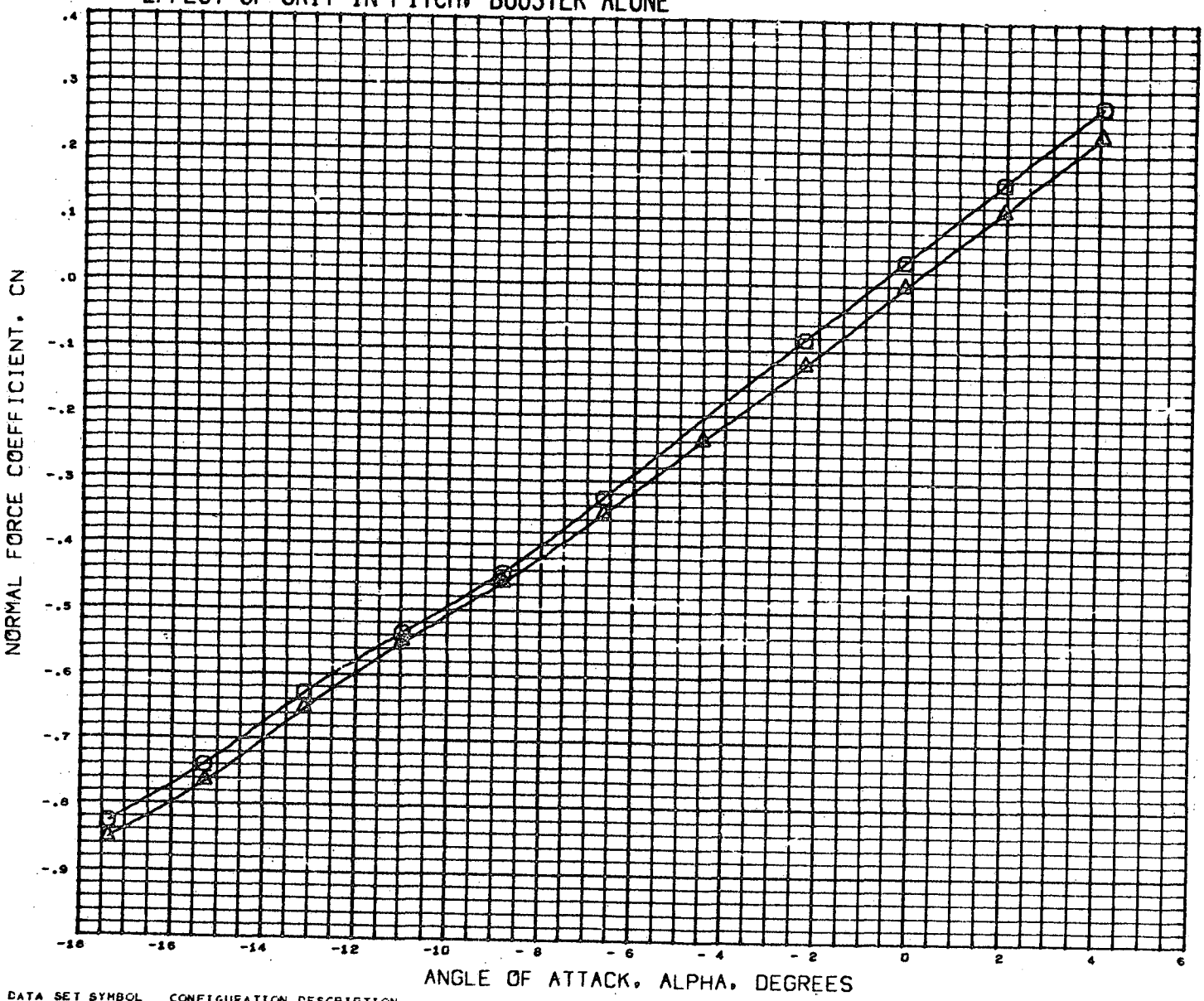
EFFECT OF GRIT IN PITCH, BOOSTER ALONE



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MACH 1.193

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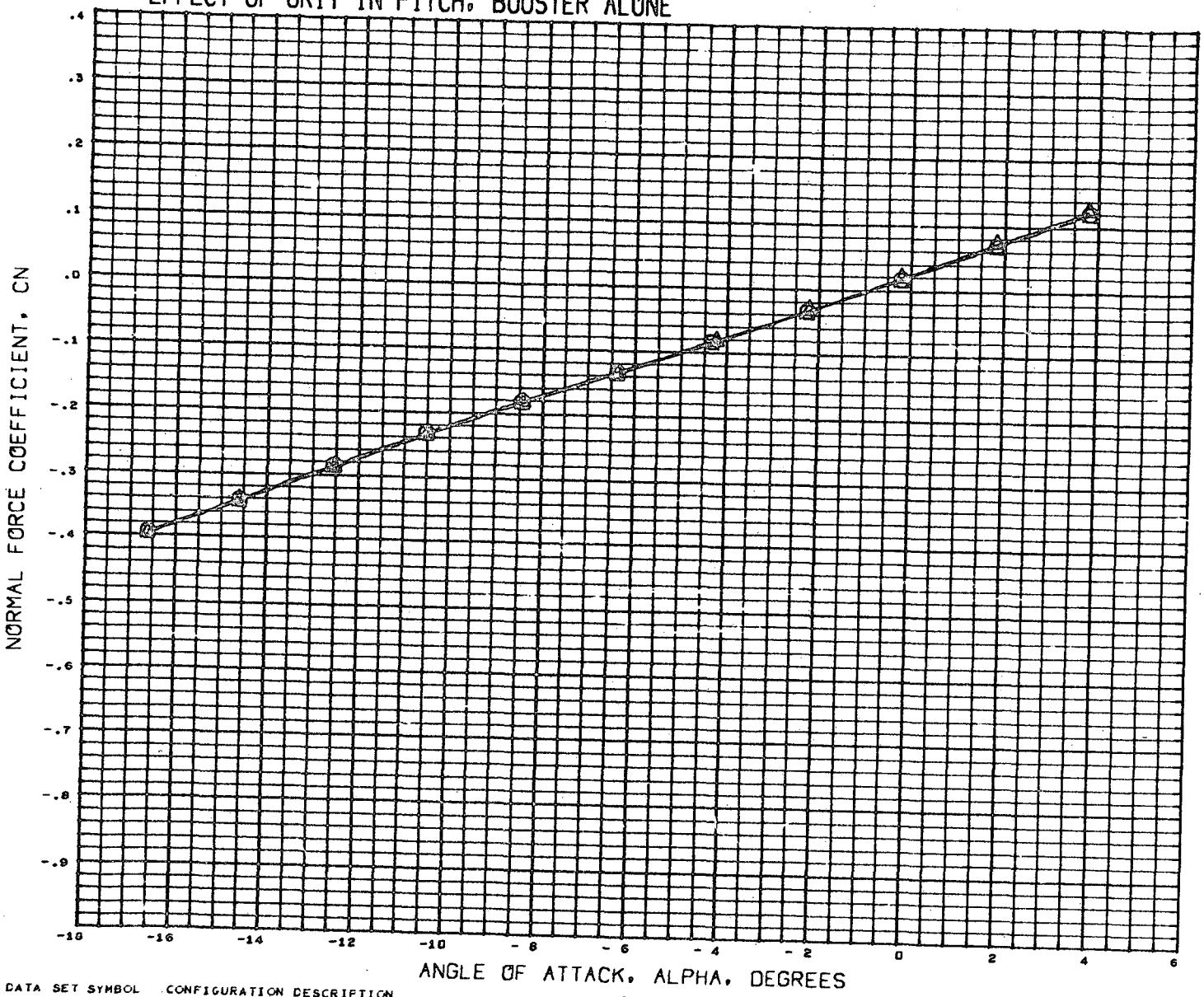
EFFECT OF GRIT IN PITCH, BOOSTER ALONE



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MACH 2.990

REFERENCE INFORMATION

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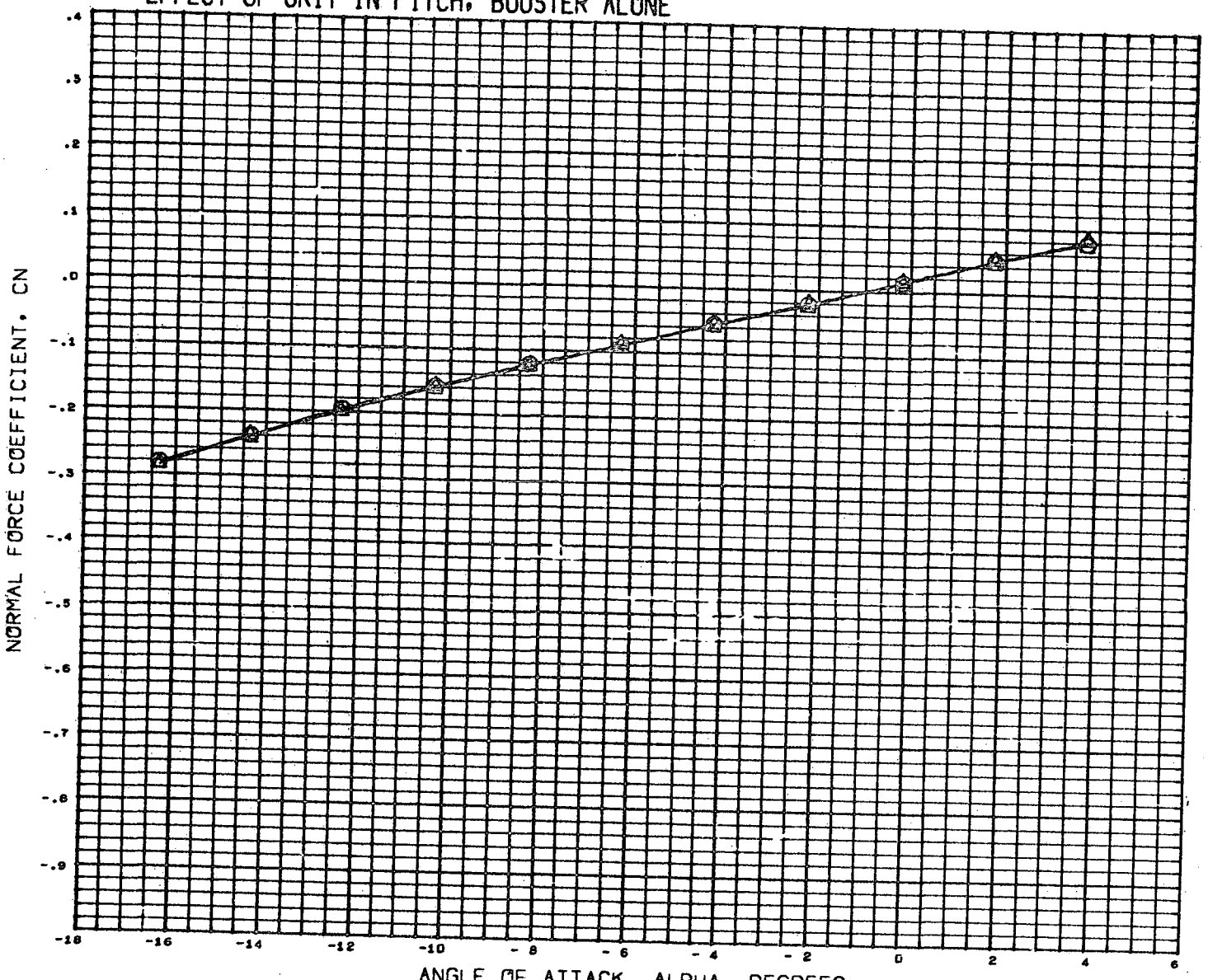
EFFECT OF GRIT IN PITCH, BOOSTER ALONE



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MACH 4.959

REFERENCE INFORMATION

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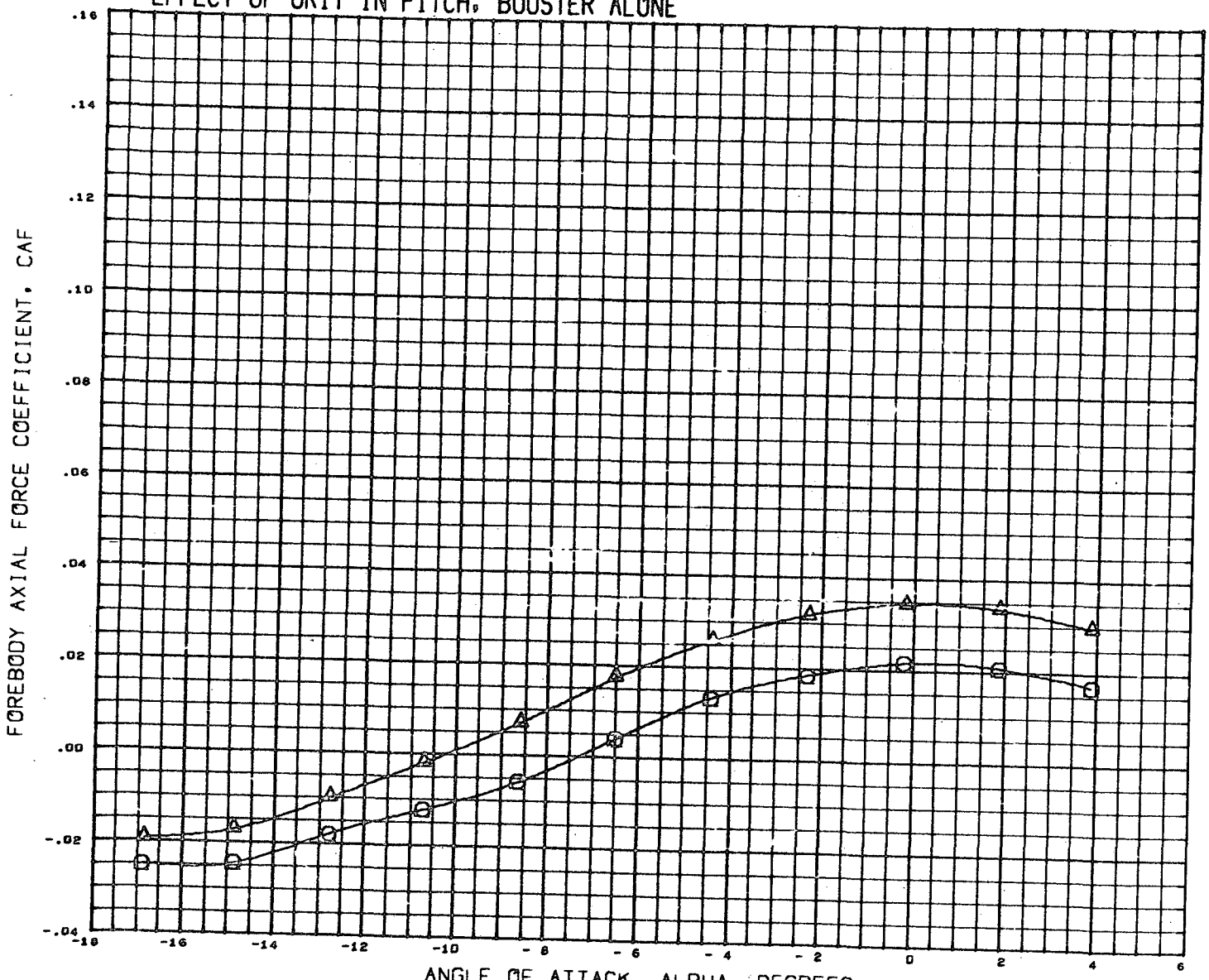
EFFECT OF GRIT IN PITCH, BOOSTER ALONE



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MACH 0.597

REFERENCE INFORMATION

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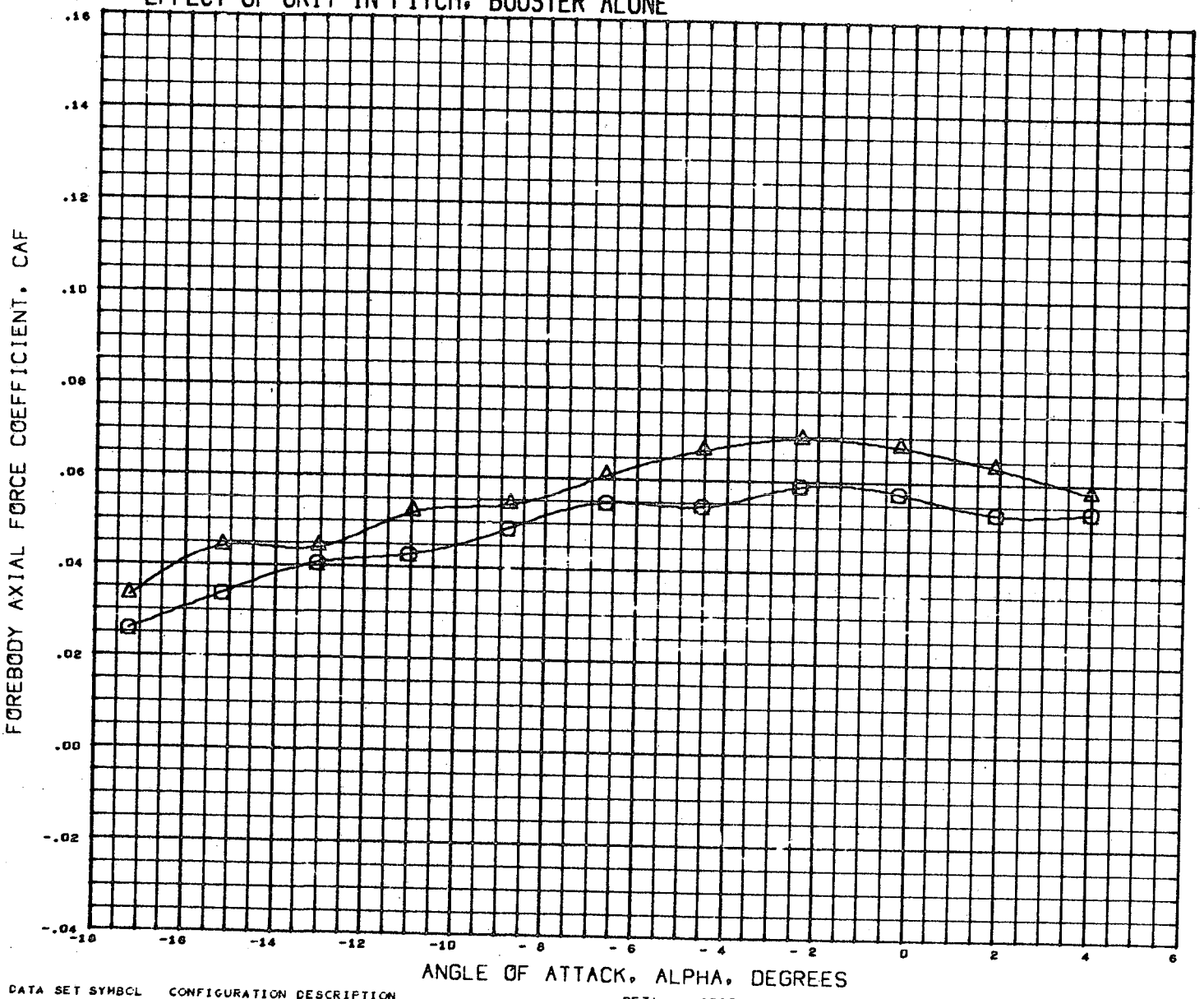
EFFECT OF GRIT IN PITCH, BOOSTER ALONE



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MACH 0.952

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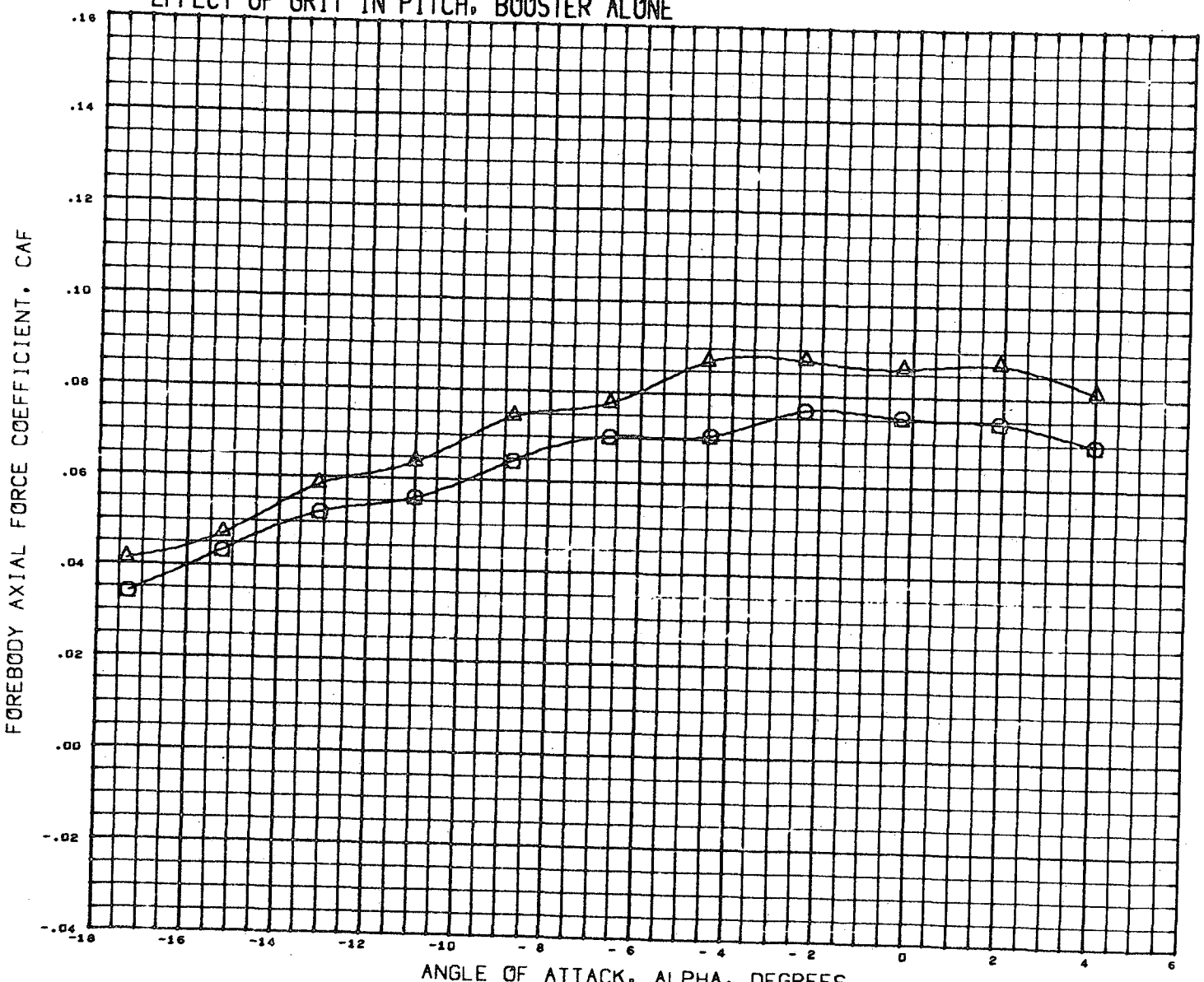
EFFECT OF GRIT IN PITCH, BOOSTER ALONE



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MACH 1.005

REFERENCE INFORMATION

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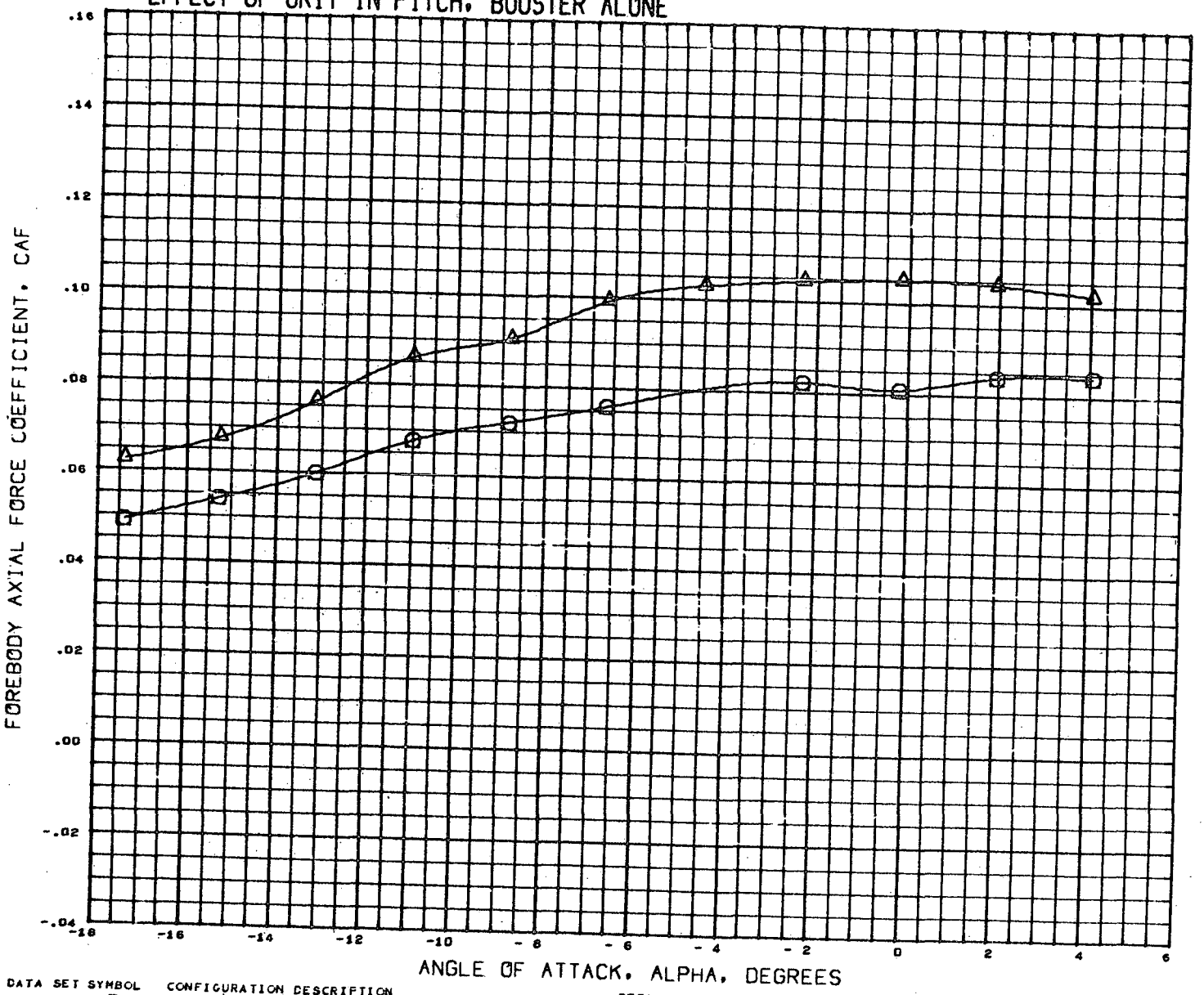
EFFECT OF GRIT IN PITCH, BOOSTER ALONE



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MACH 1.193

REFERENCE INFORMATION

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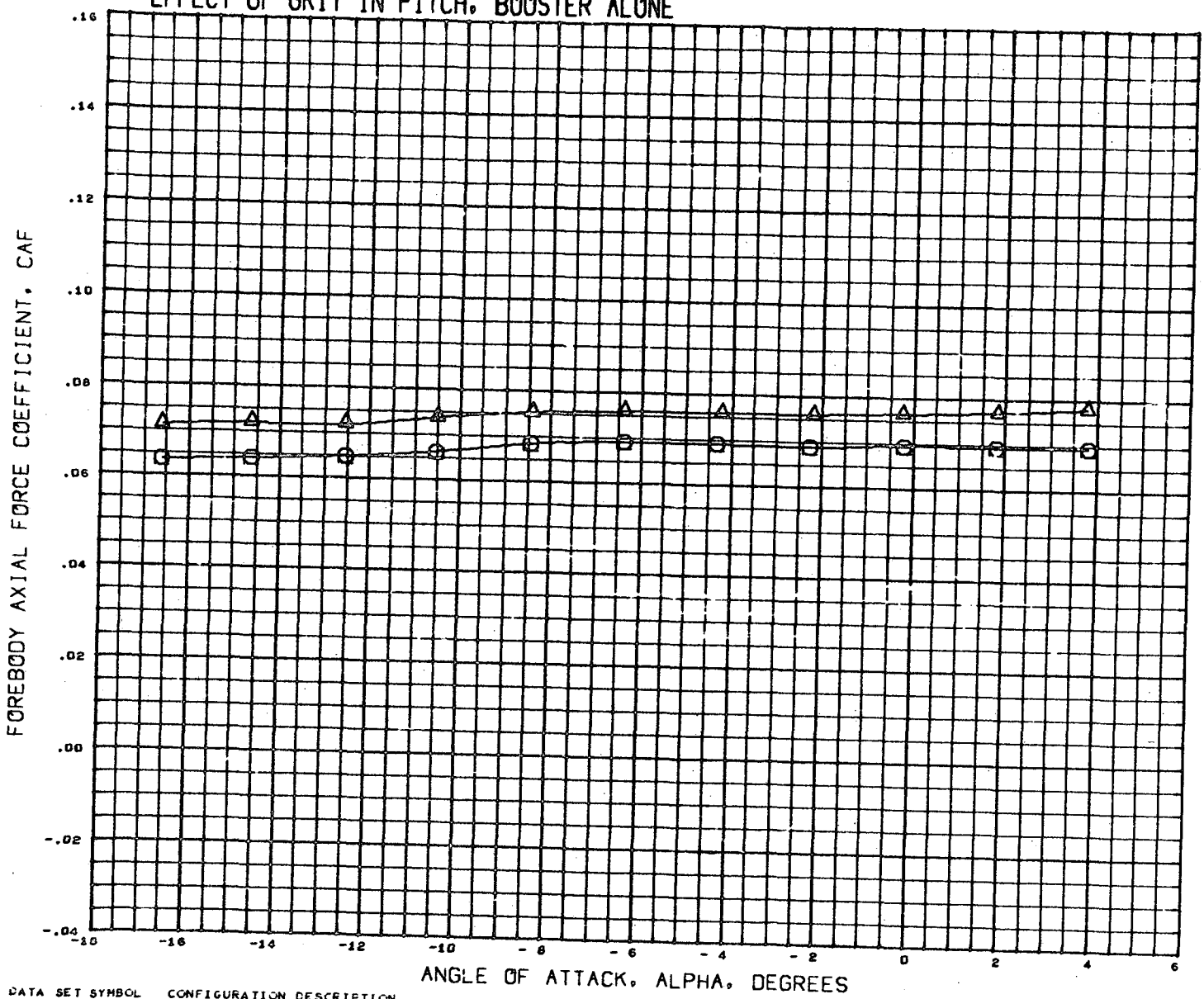
EFFECT OF GRIT IN PITCH, BOOSTER ALONE



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MACH 2.990

REFERENCE INFORMATION

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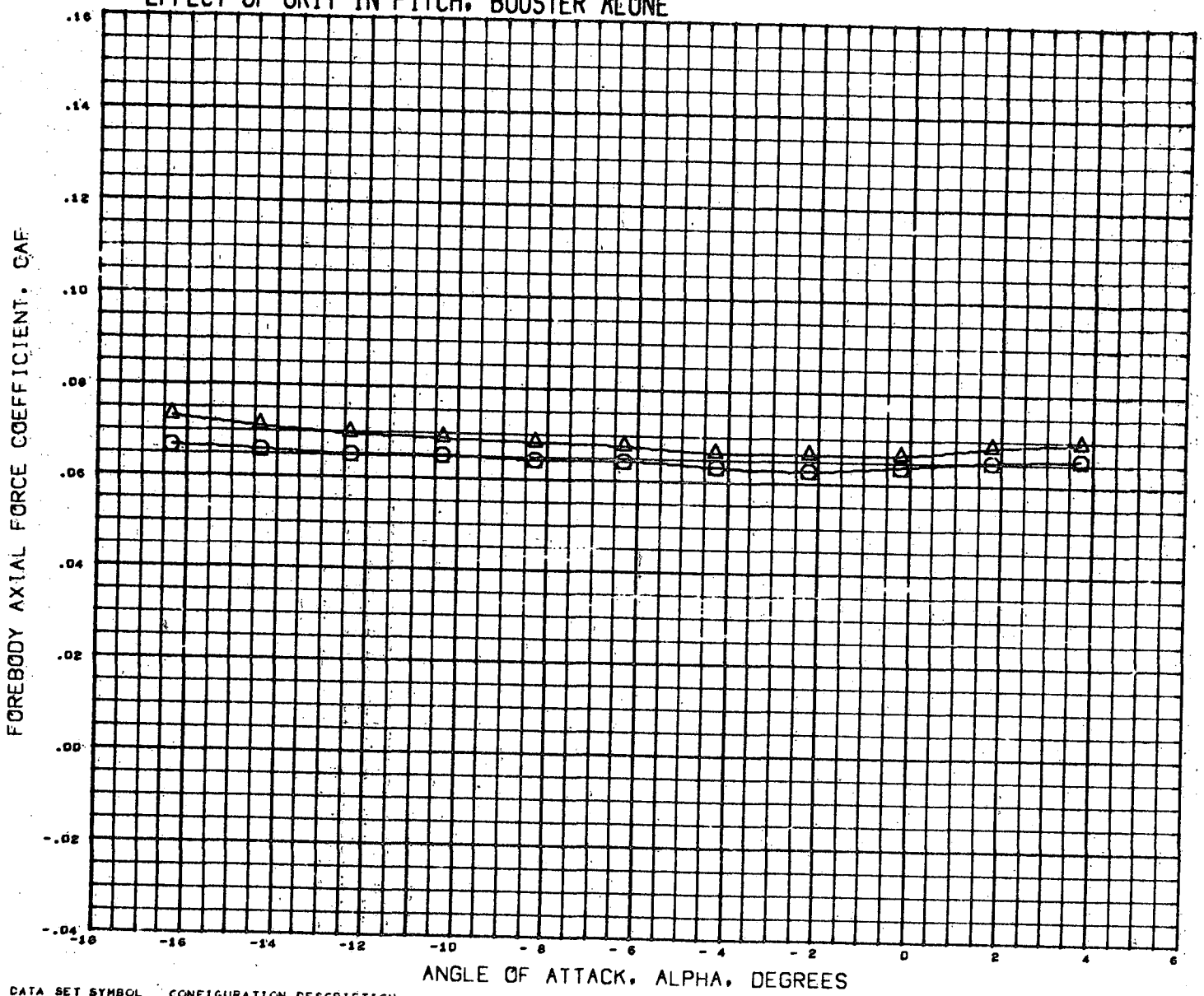
EFFECT OF GRIT IN PITCH, BOOSTER ALONE



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MACH 4.959

REFERENCE INFORMATION

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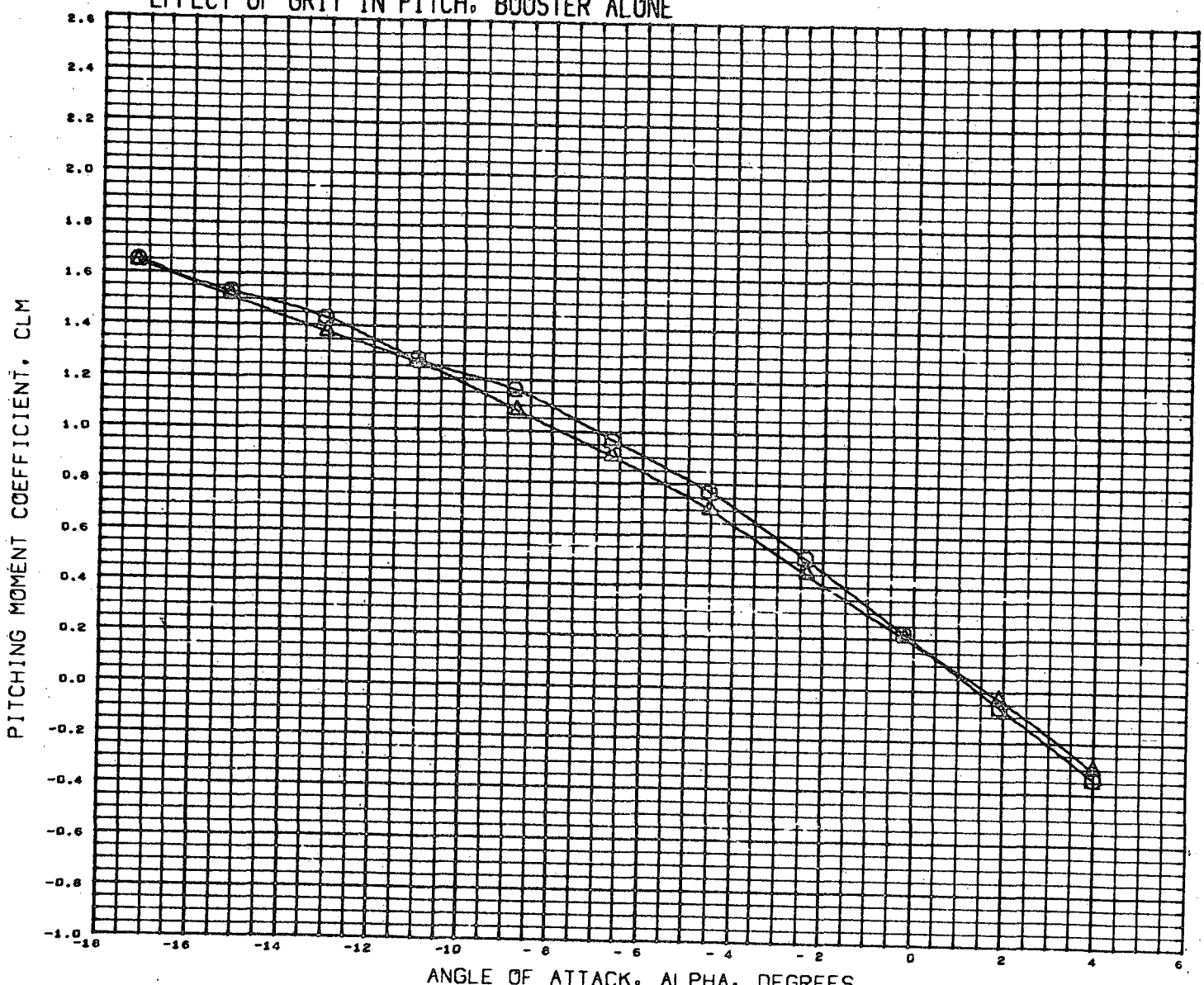
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF GRIT IN PITCH. BOOSTER ALONE



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MACH 0.952

REFERENCE INFORMATION

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BREF	6.0990	INCHES
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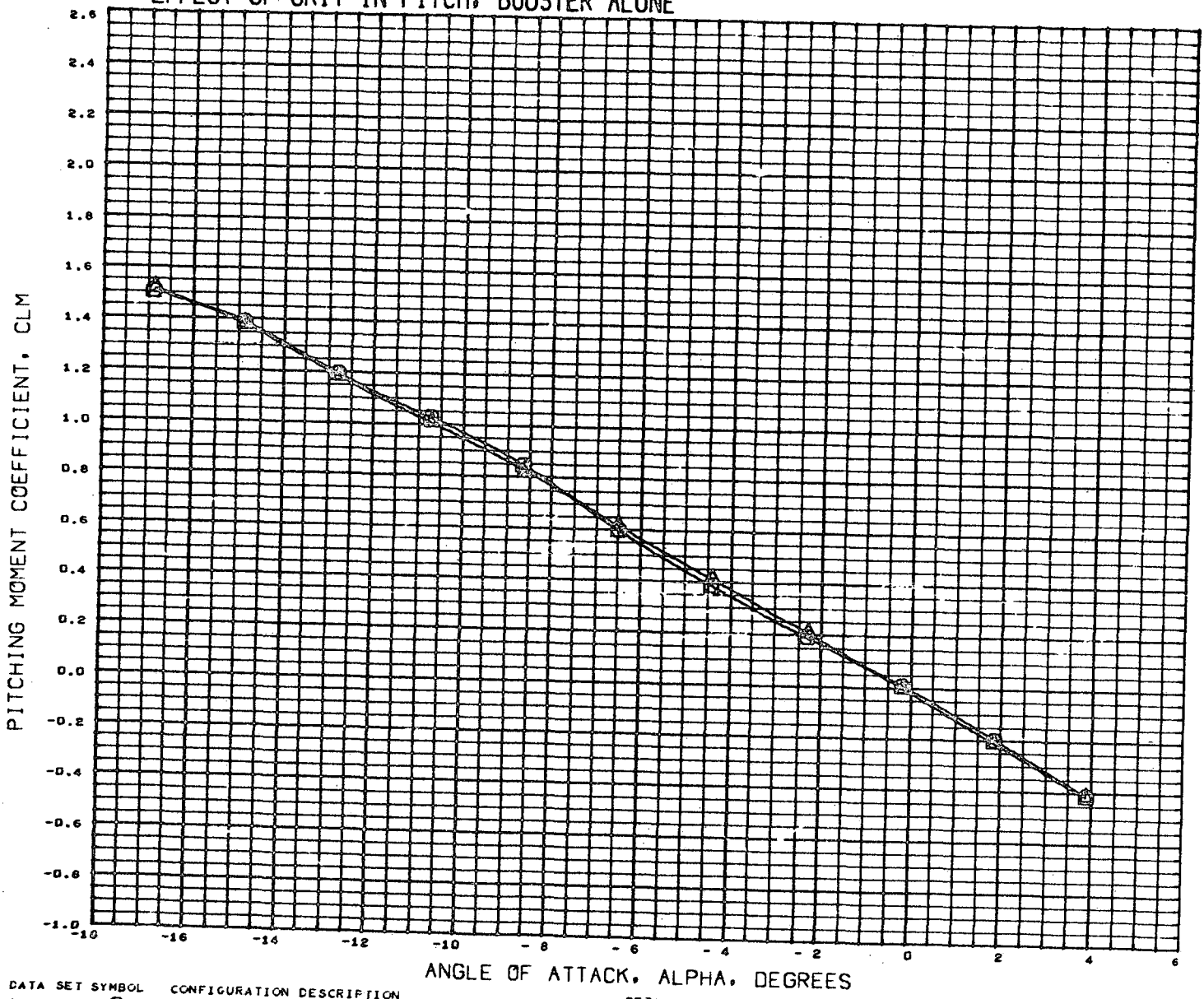
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF GRIT IN PITCH, BOOSTER ALONE



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(A3901A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3902A)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

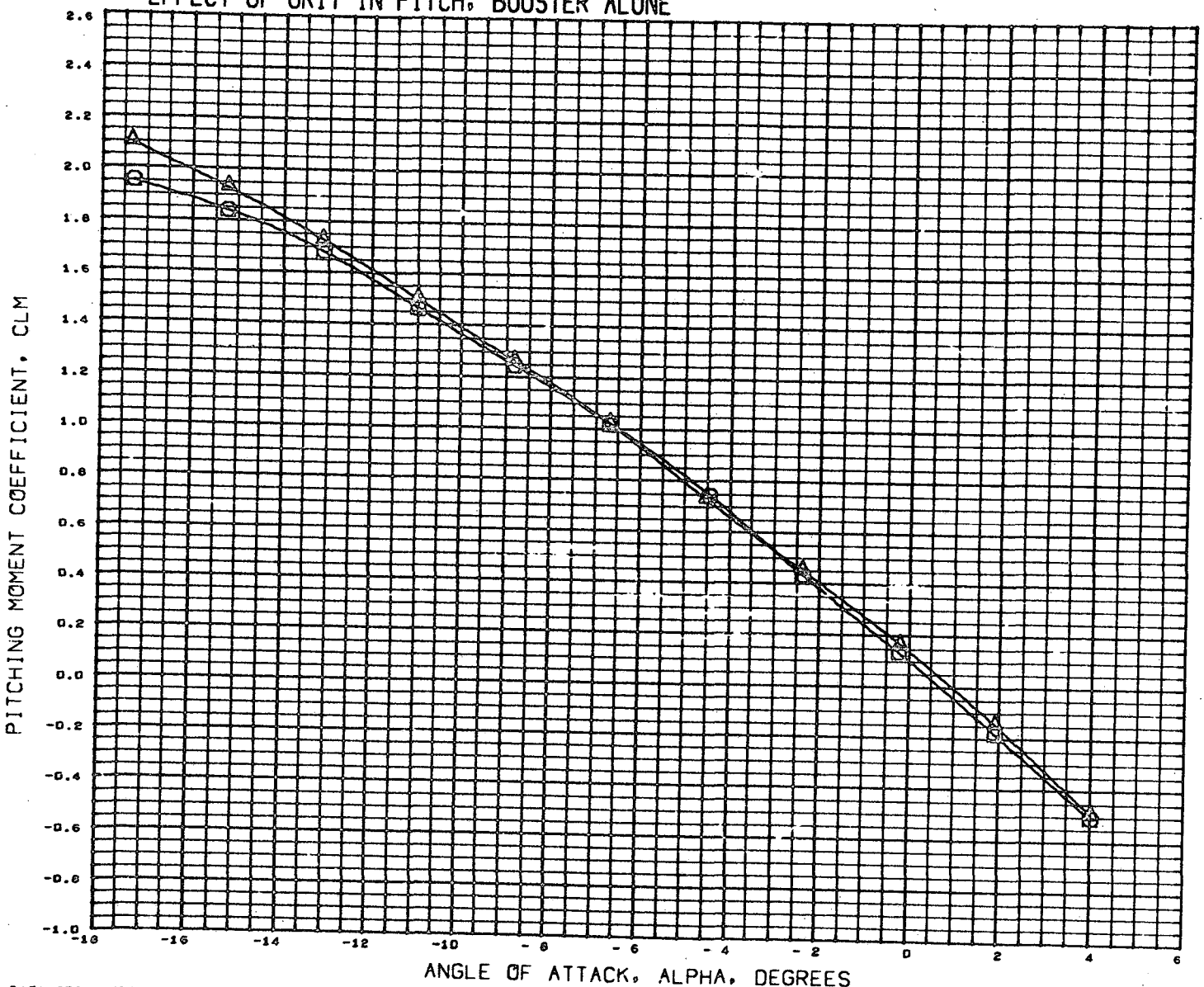
BETA	GRIT
0.000	
0.000	54.000

MACH 0.597

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF GRIT IN PITCH, BOOSTER ALONE



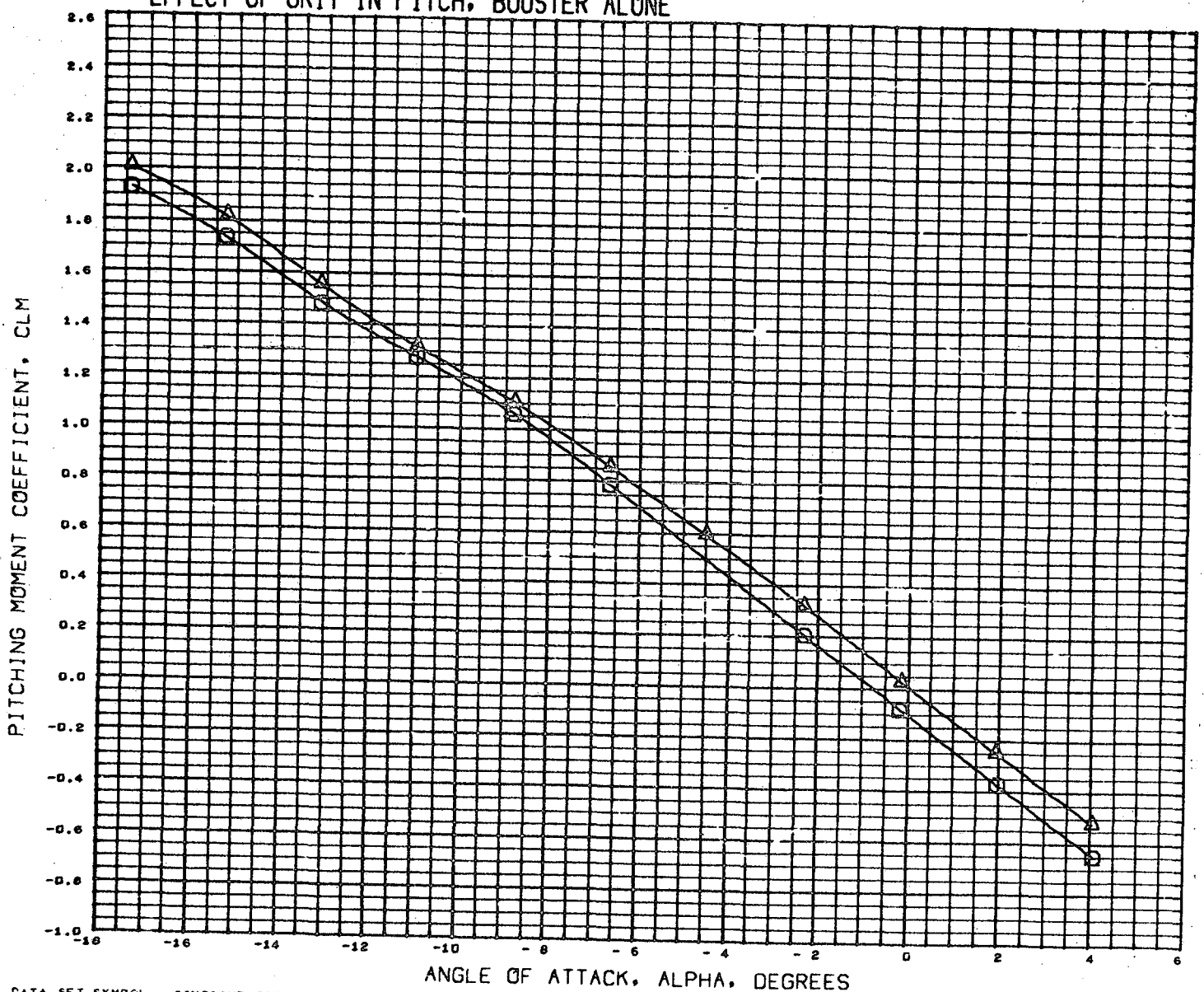
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	GRIT
(A39D1A)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	0.000	
(A39D2A)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	0.000	54.000

MACH 1.005

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF GRIT IN PITCH, BOOSTER ALONE



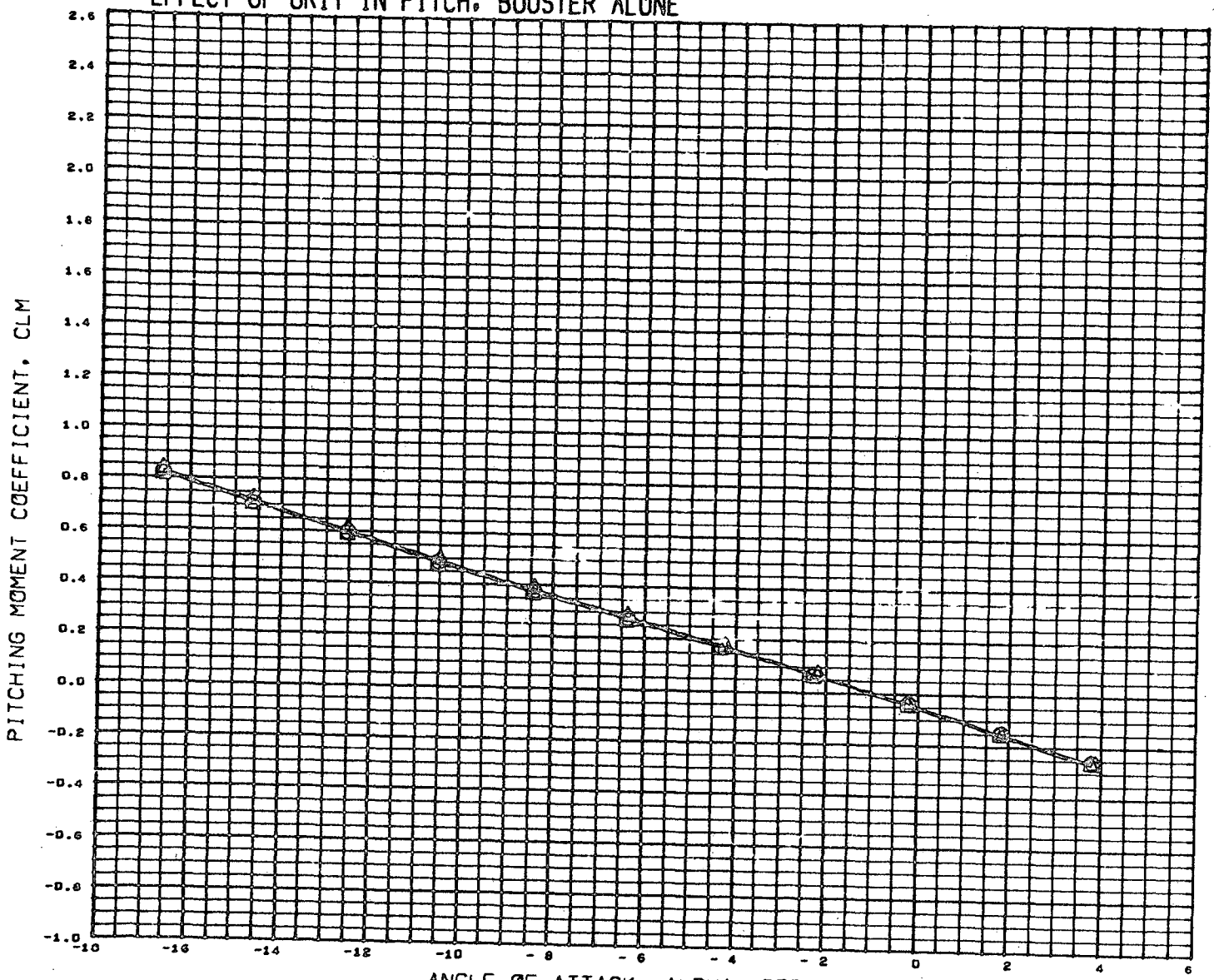
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	GRIT
(A39D1A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	0.000	
(A39G2A)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	0.000	54.000

MACH 1.193

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF GRIT IN PITCH, BOOSTER ALONE



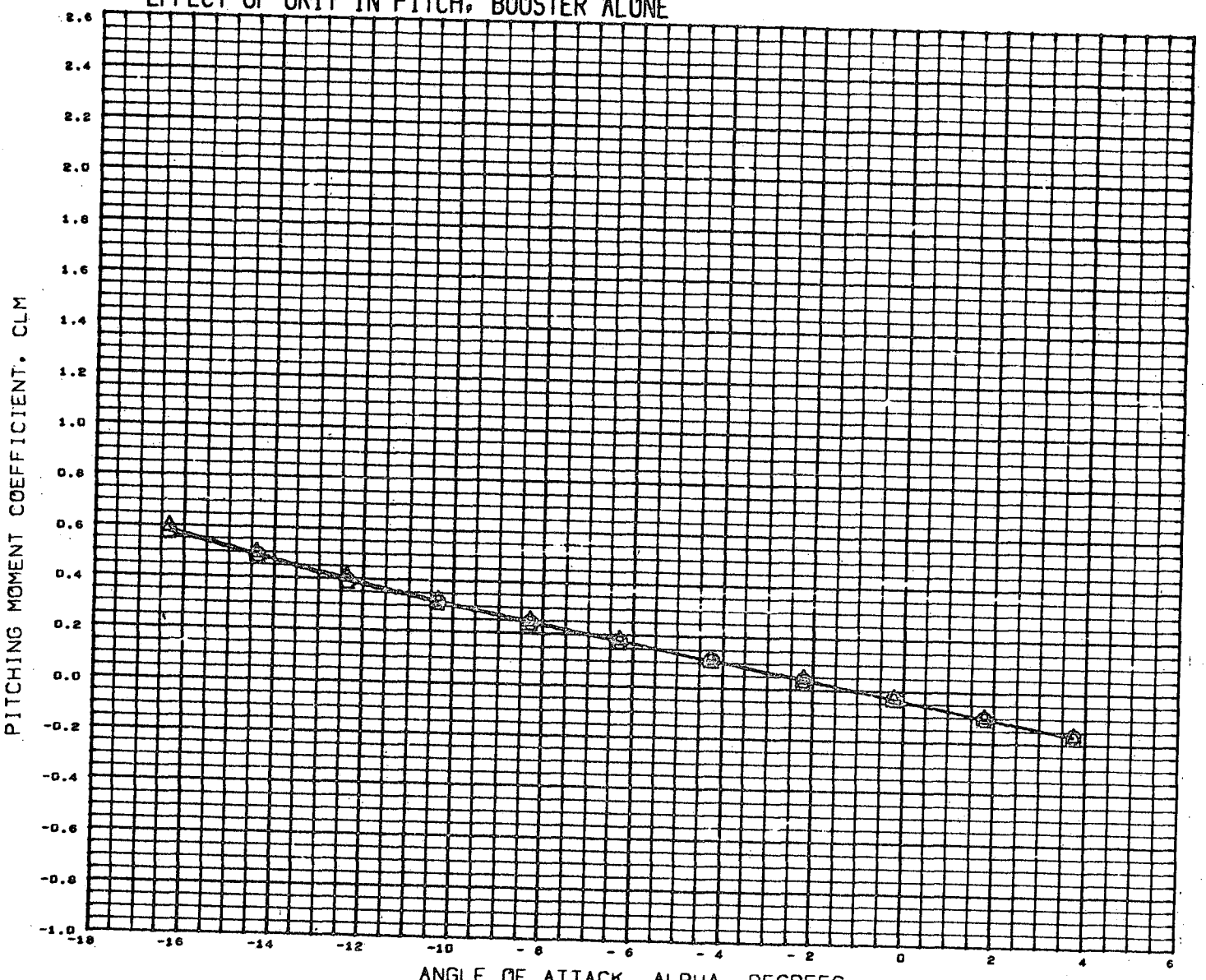
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	GRIT
(A3901A)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	0.000	
(A3902A)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	0.000	54.000

MACH 2.990

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF GRIT IN PITCH, BOOSTER ALONE



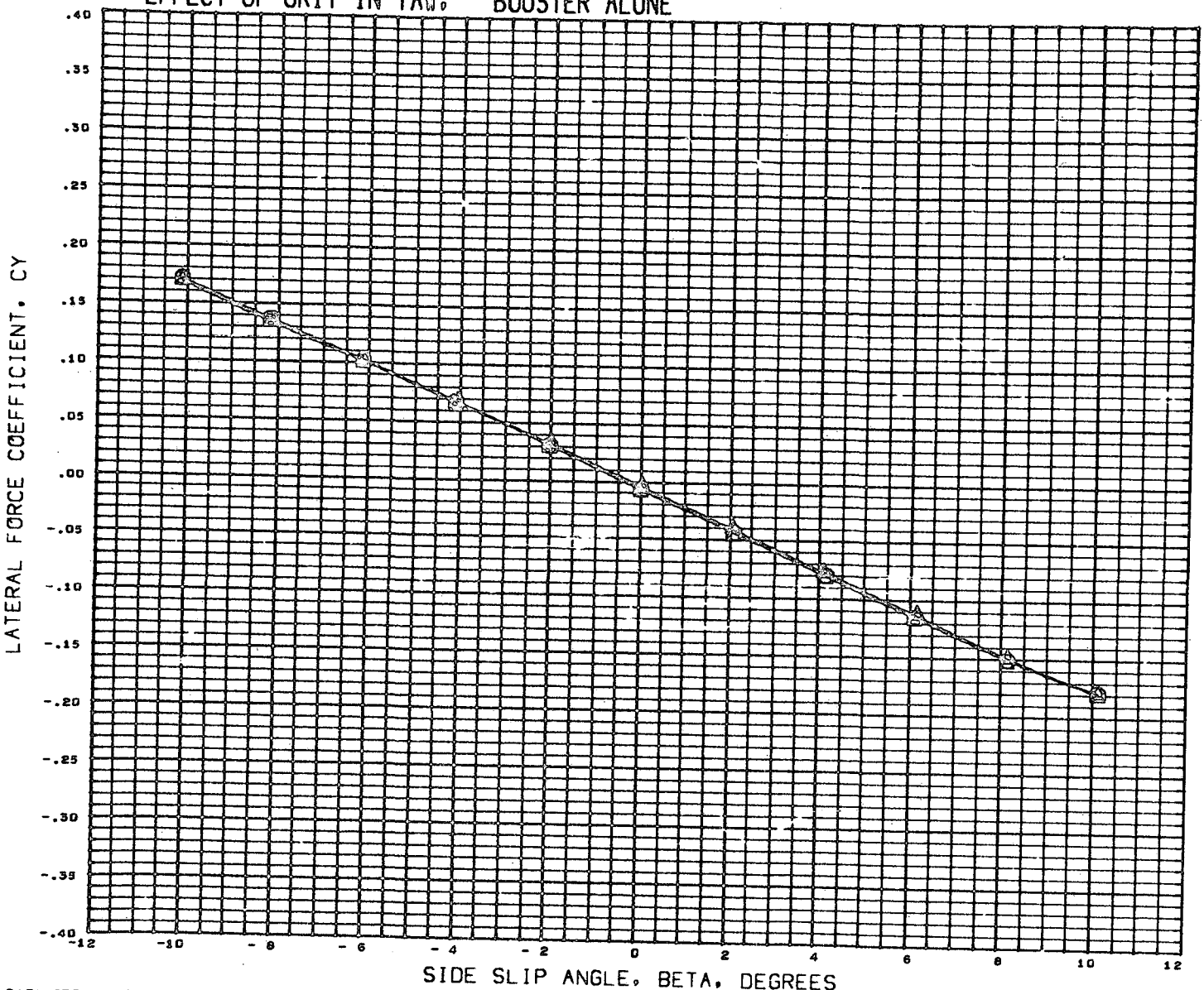
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	GRIT
(A3901A)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	0.000	
(A3902A)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	0.000	54.000

MACH 4.959

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF GRIT IN YAW. BOOSTER ALONE



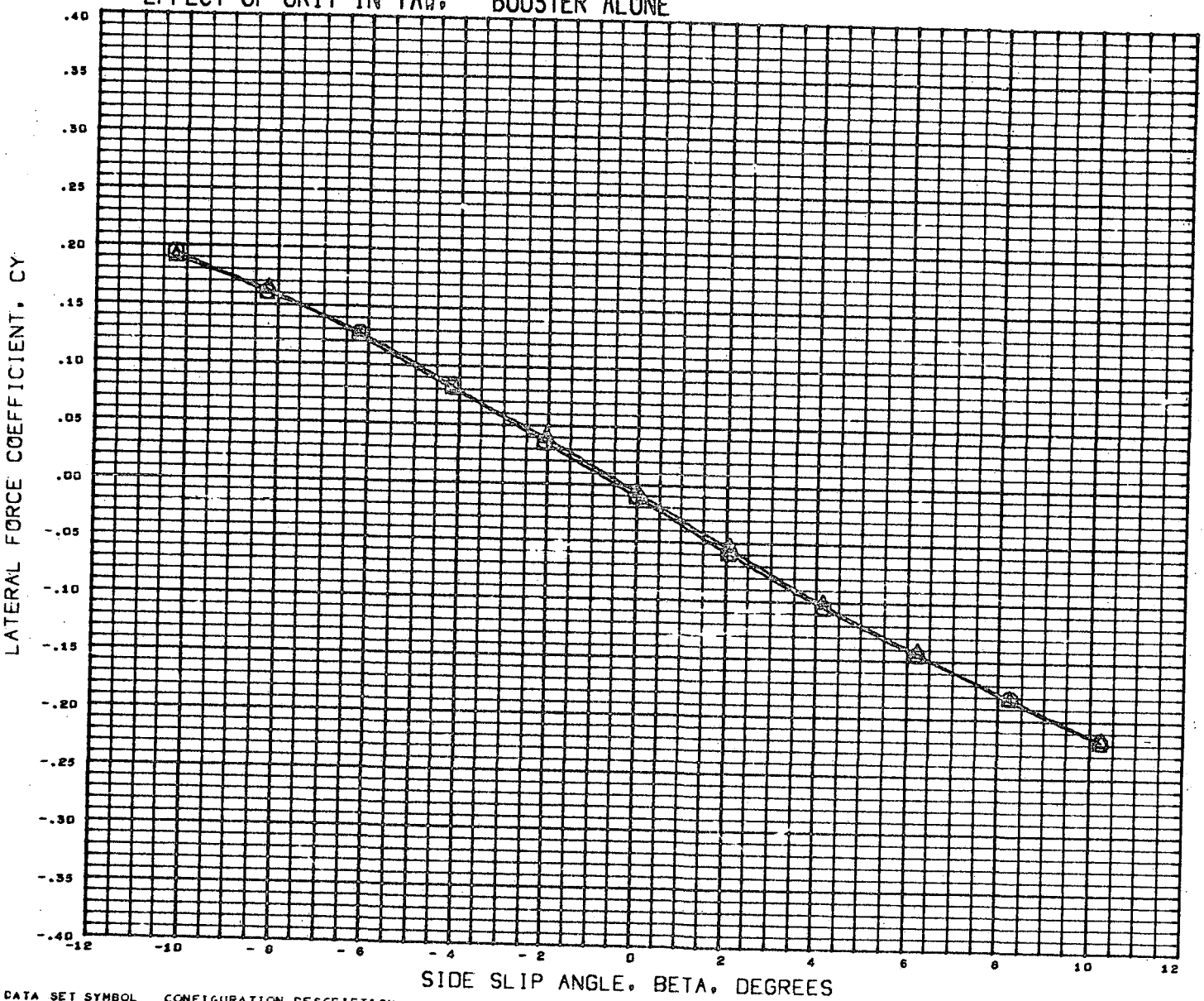
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	GRIT
(A3901B)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	
(A3902B)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	54.000

MACH 0.600

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF GRIT IN YAW, BOOSTER ALONE



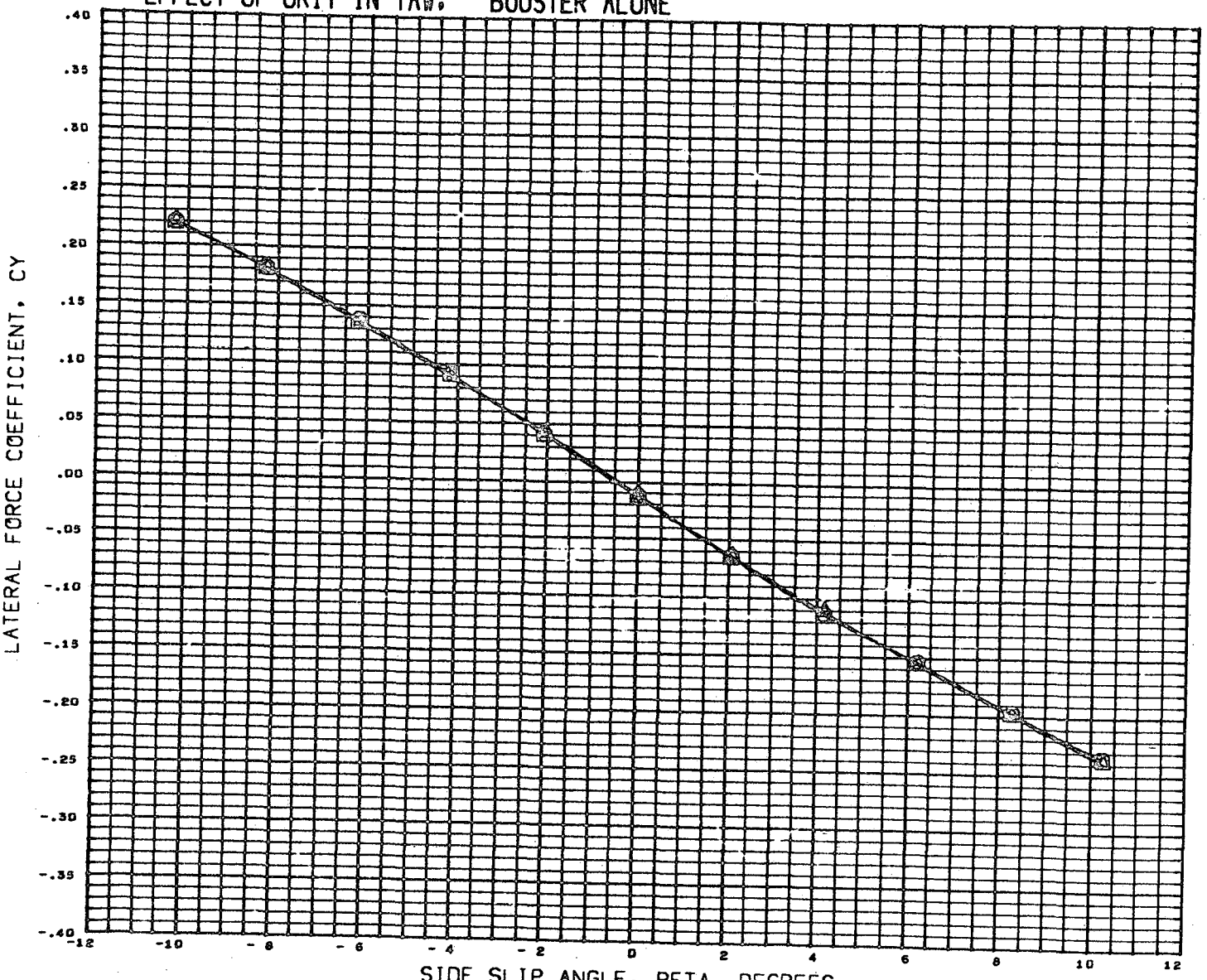
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	GRIT
(A3901B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	
(A3902B)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	54.000

MACH 0.951

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF GRIT IN YAW. BOOSTER ALONE



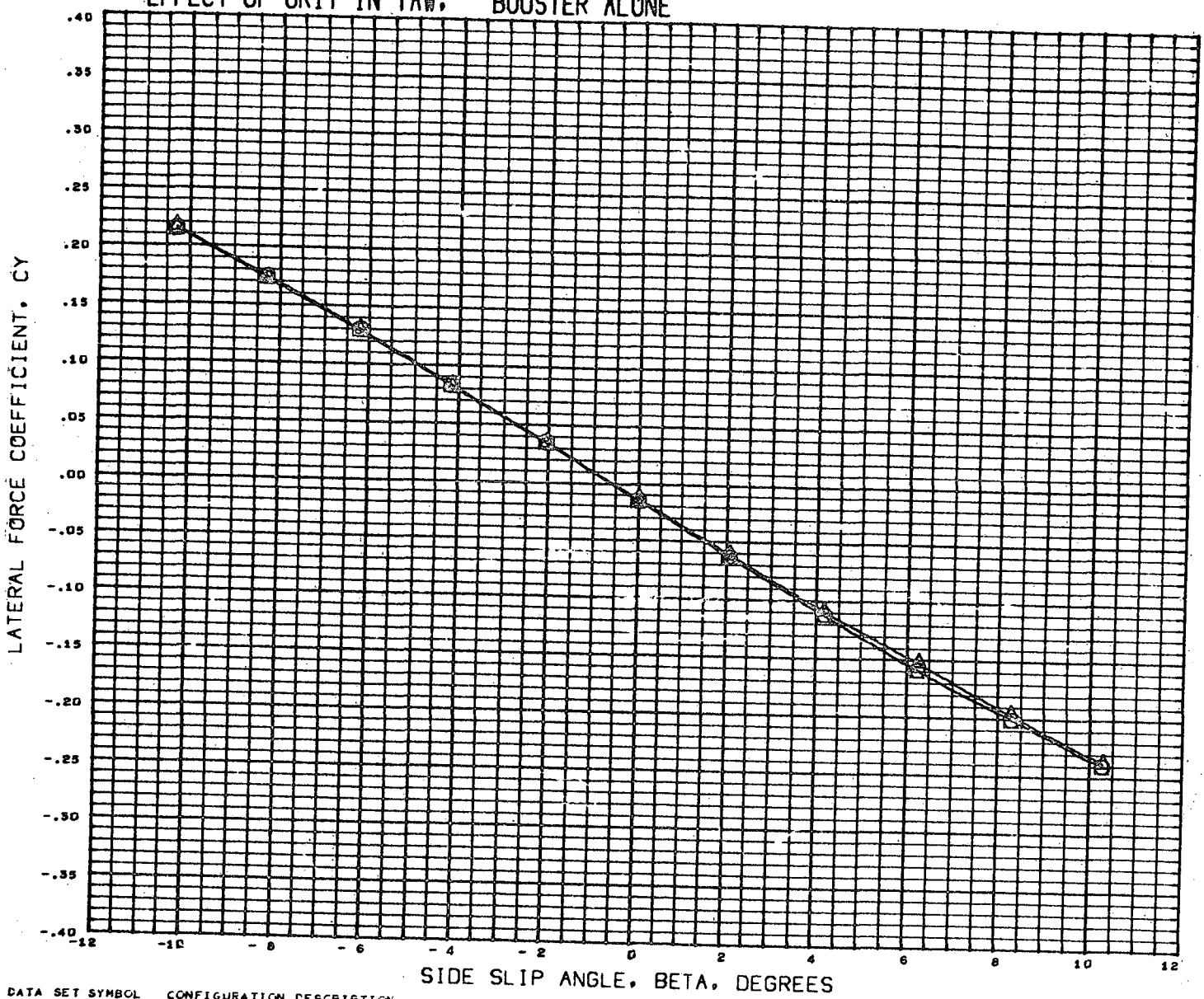
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	GRIT
(A39018)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	
(A39028)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	54.000

MACH 1.002

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF GRIT IN YAW, BOOSTER ALONE



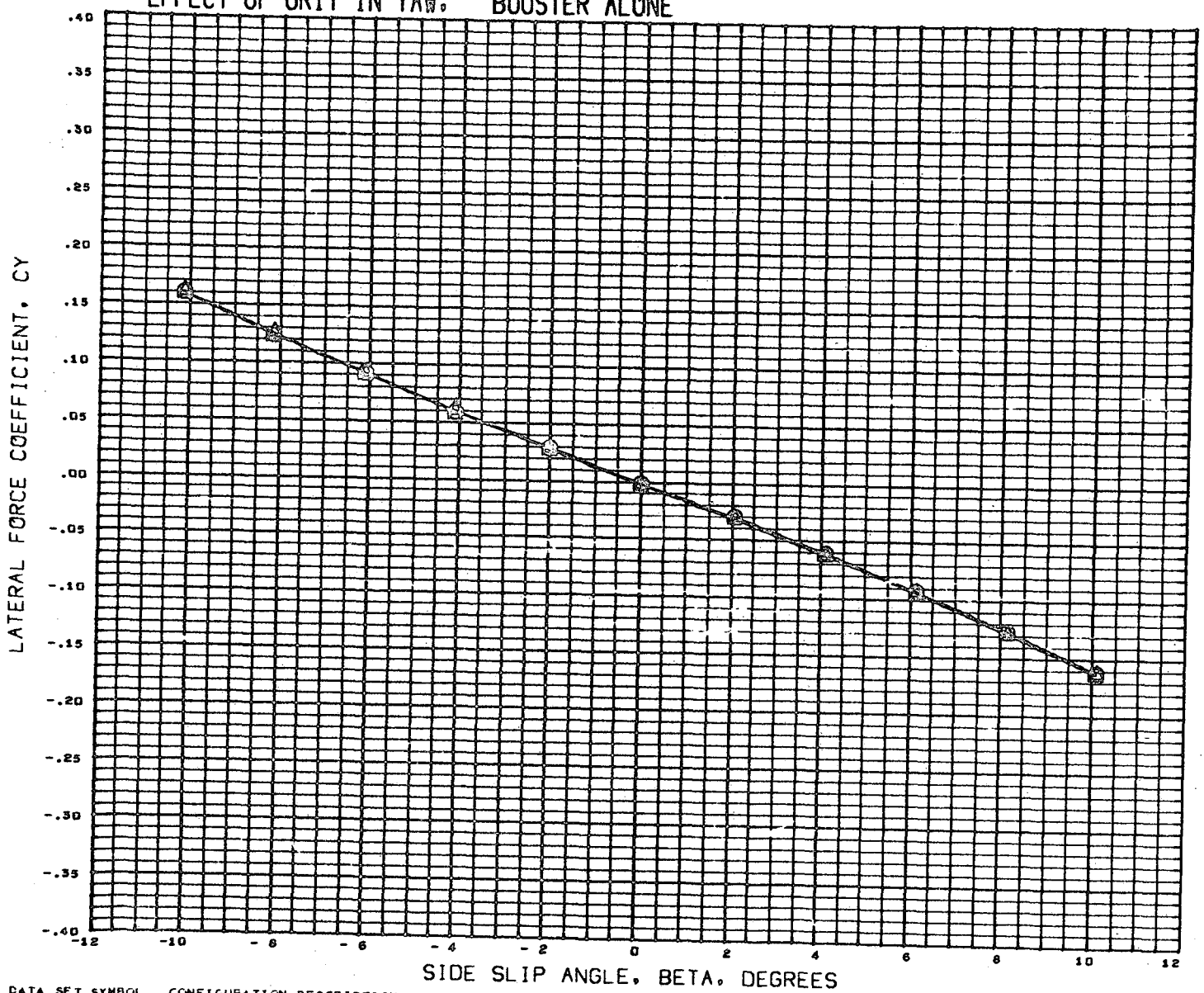
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	GRIT
(A3901B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	
(A3902B)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	54.000

MACH 1.193

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF GRIT IN YAW. BOOSTER ALONE



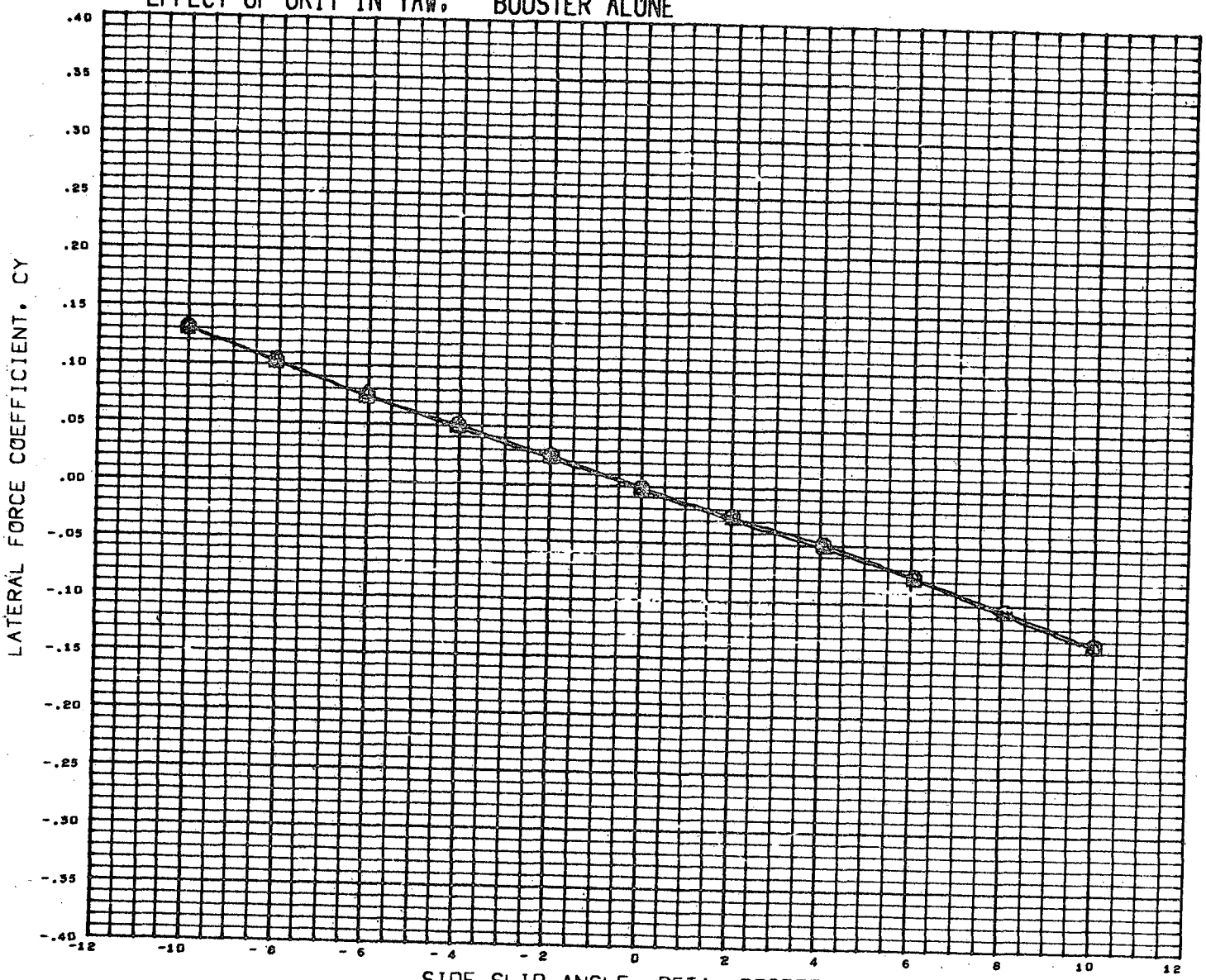
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	GRIT
(A3901B)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	
(A3902B)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	54.000

MACH 2.990

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	9.0031	SCALE

EFFECT OF GRIT IN YAW, BOOSTER ALONE



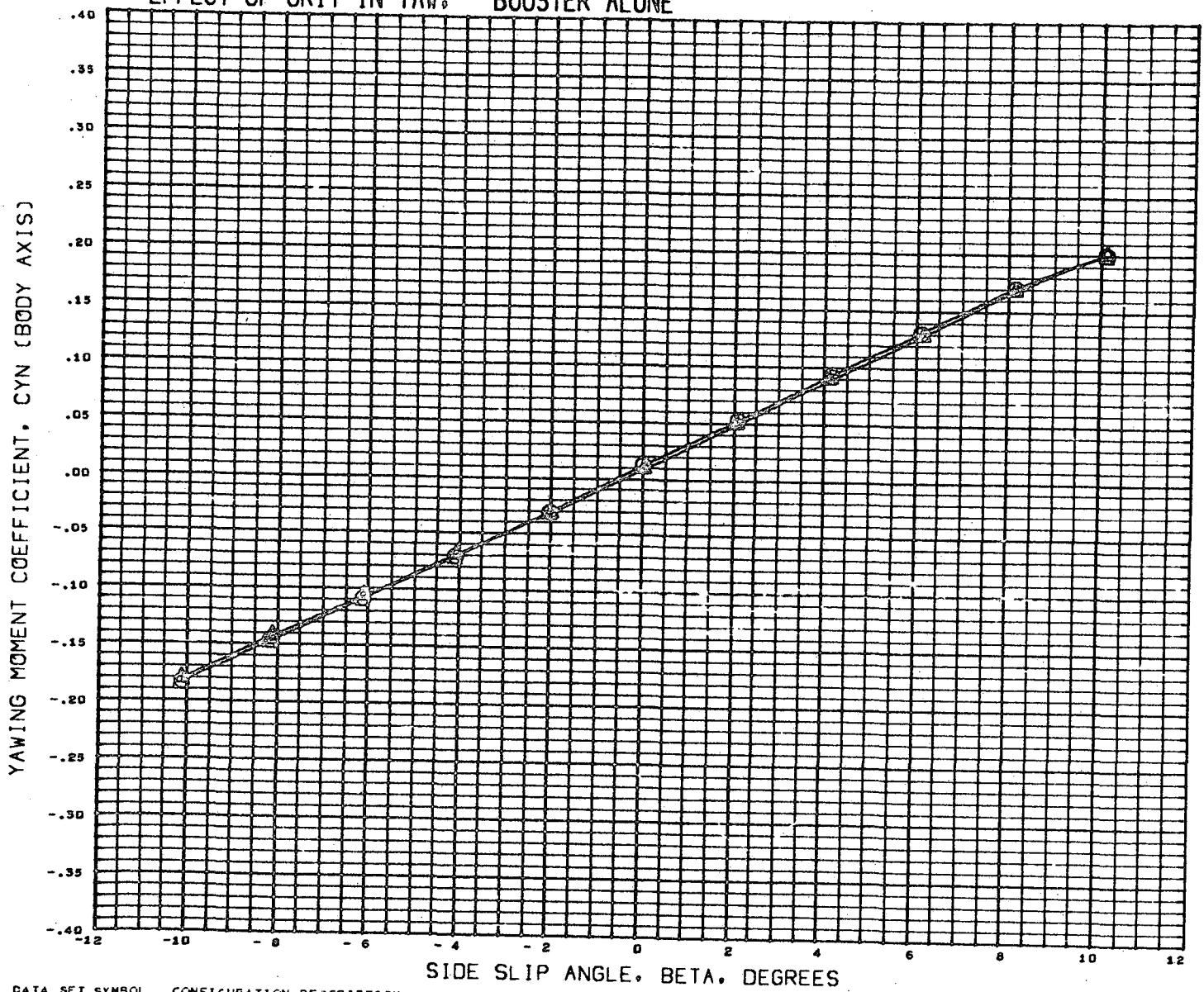
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	GRIT
(A39018)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	
(A39028)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	54.000

MACH 4.959

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF GRIT IN YAW. BOOSTER ALONE



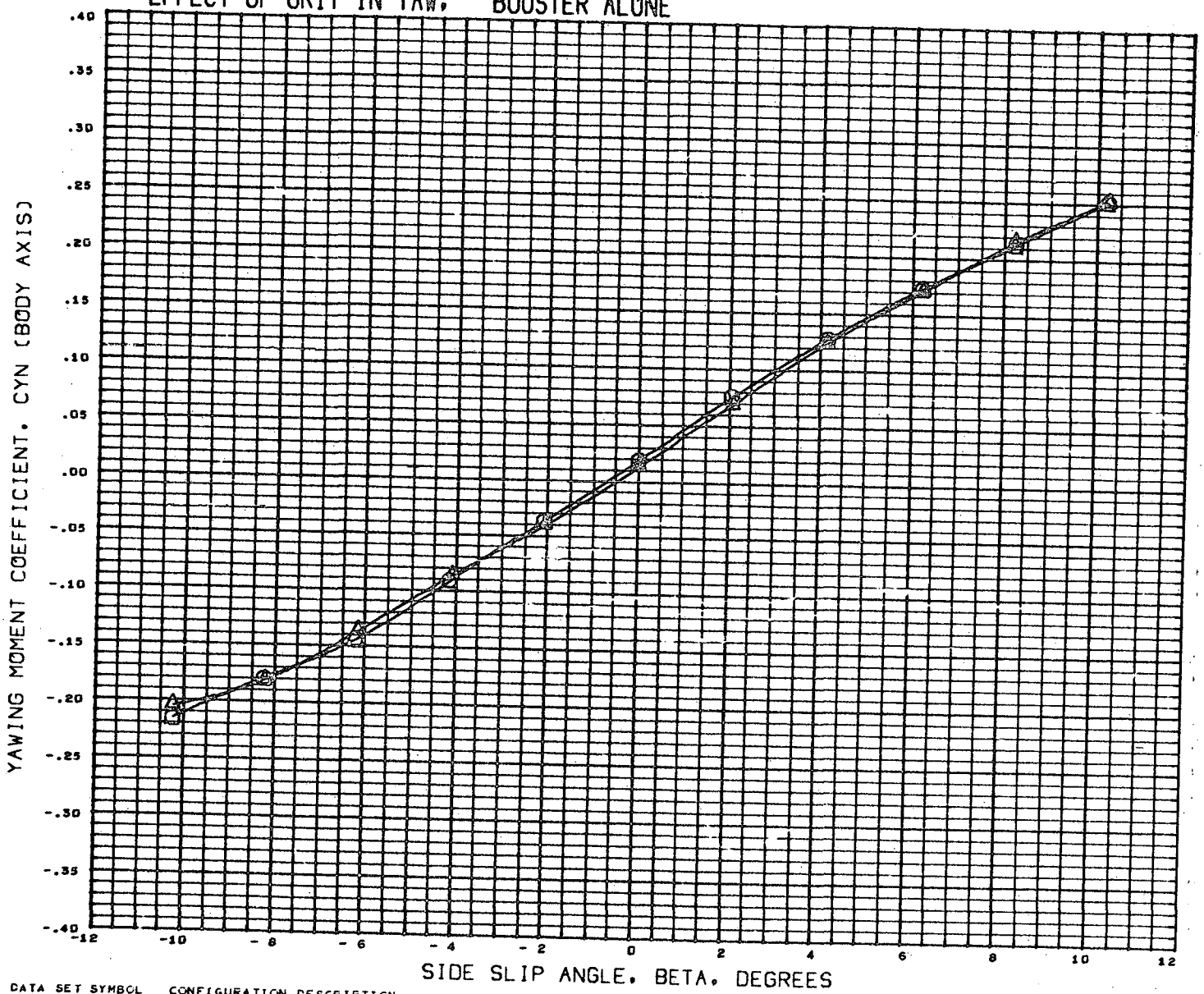
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	GRIT
(A3901B)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	
(A3902B)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	54.000

MACH 0.600

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF GRIT IN YAW, BOOSTER ALONE



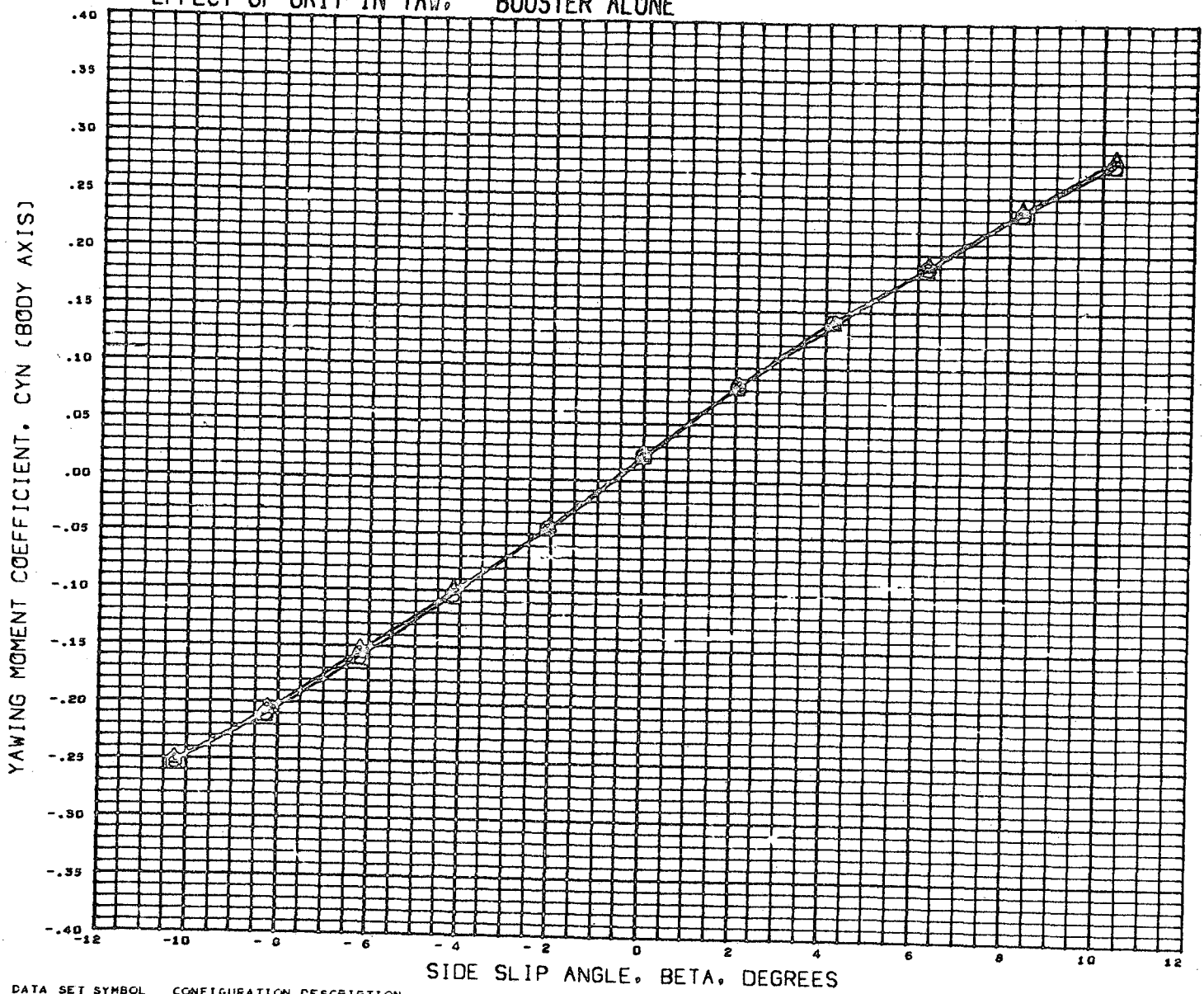
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	GRIT
(A3901B)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	
(A3902B)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	54.000

MACH 0.951

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF GRIT IN YAW. BOOSTER ALONE



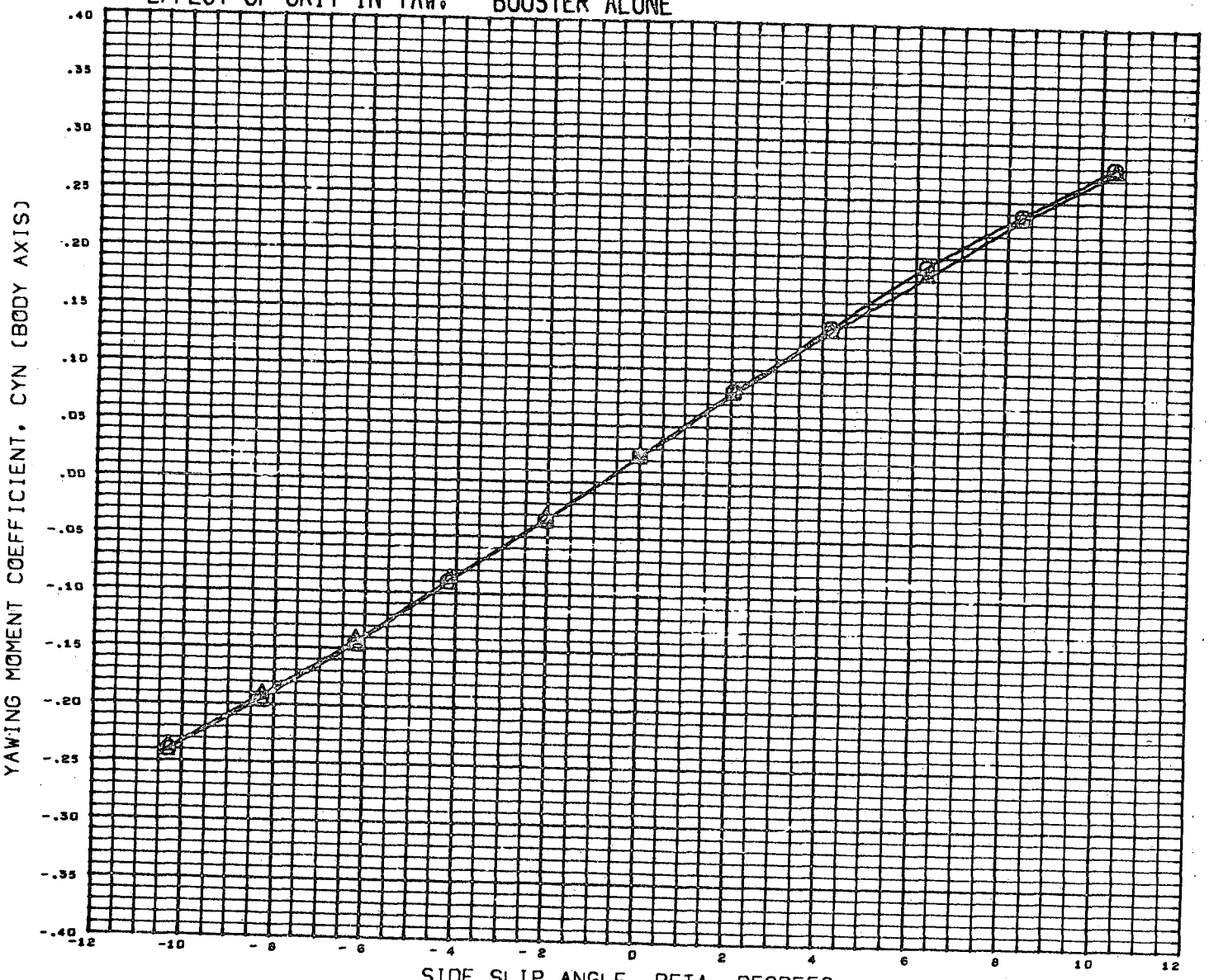
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	GRIT
(A3901B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	
(A3902B)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	54.000

MACH 1.002

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF GRIT IN YAW. BOOSTER ALONE



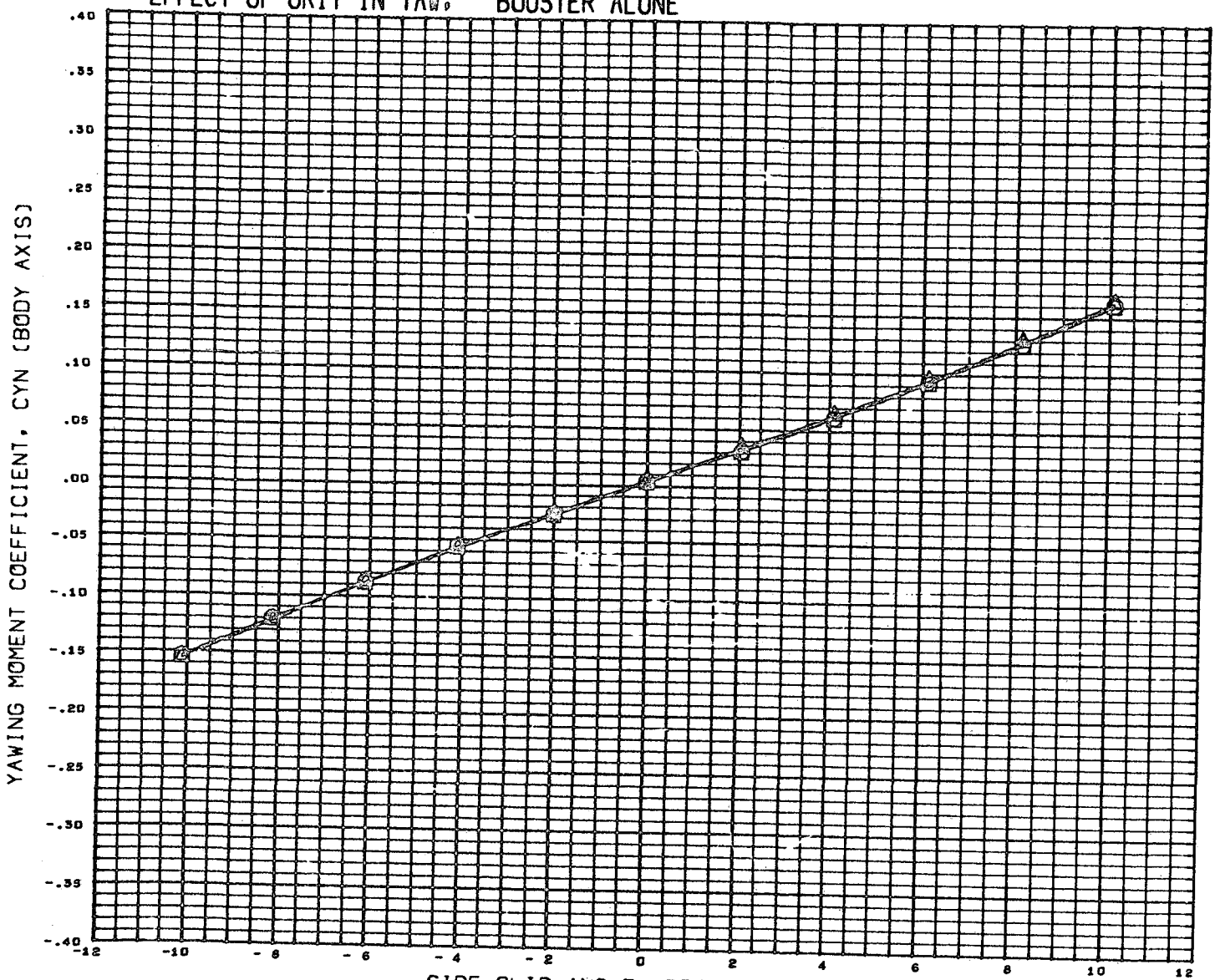
DATA SET SYMBOL		CONFIGURATION DESCRIPTION	ALPHA	GRIT
(A3901B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	
(A3902B)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	54.000

MACH 1.193

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF GRIT IN YAW. BOOSTER ALONE

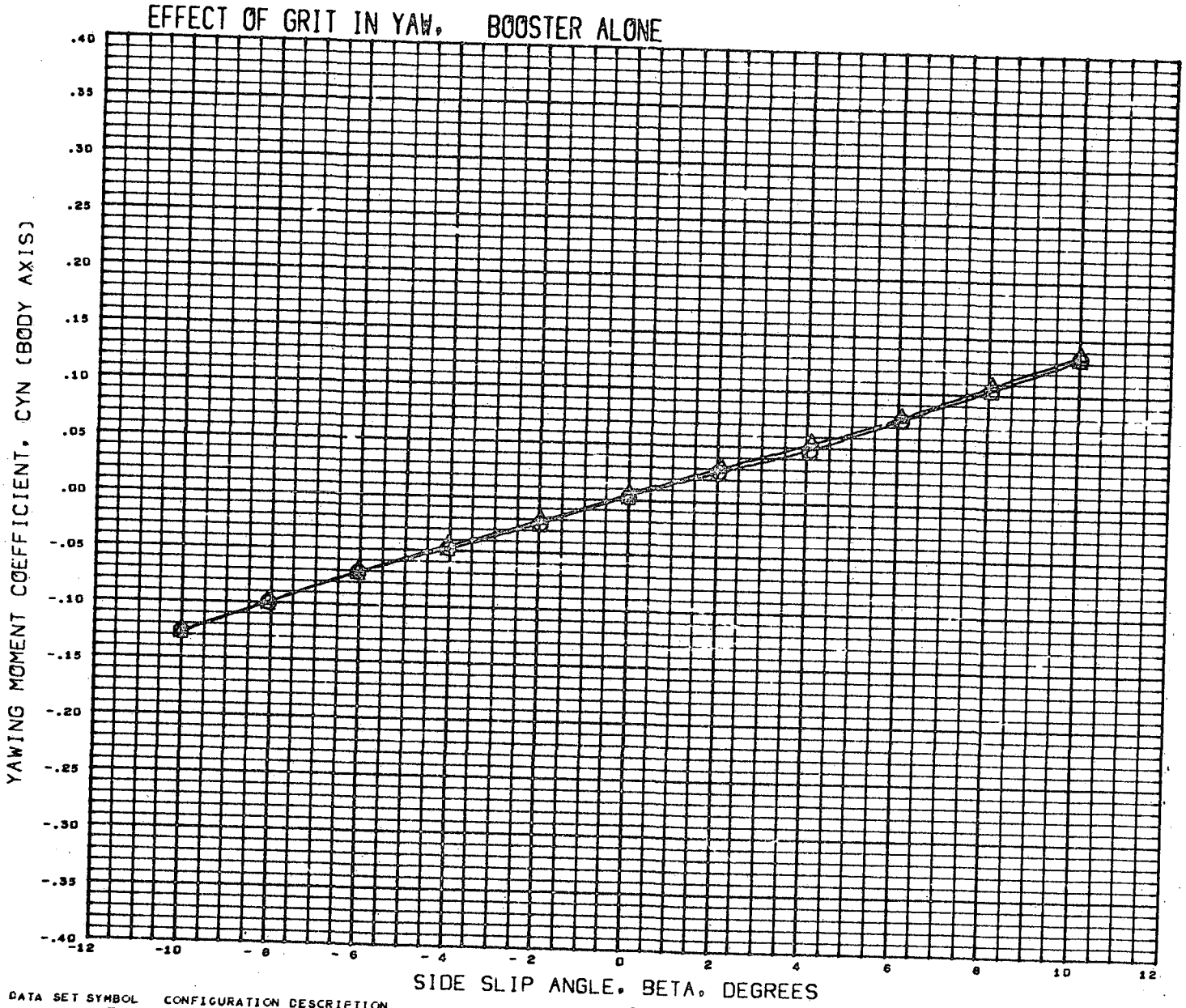


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	GRIT
(A3901B)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	
(A3902B)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	54.000

MACH 2.990

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE



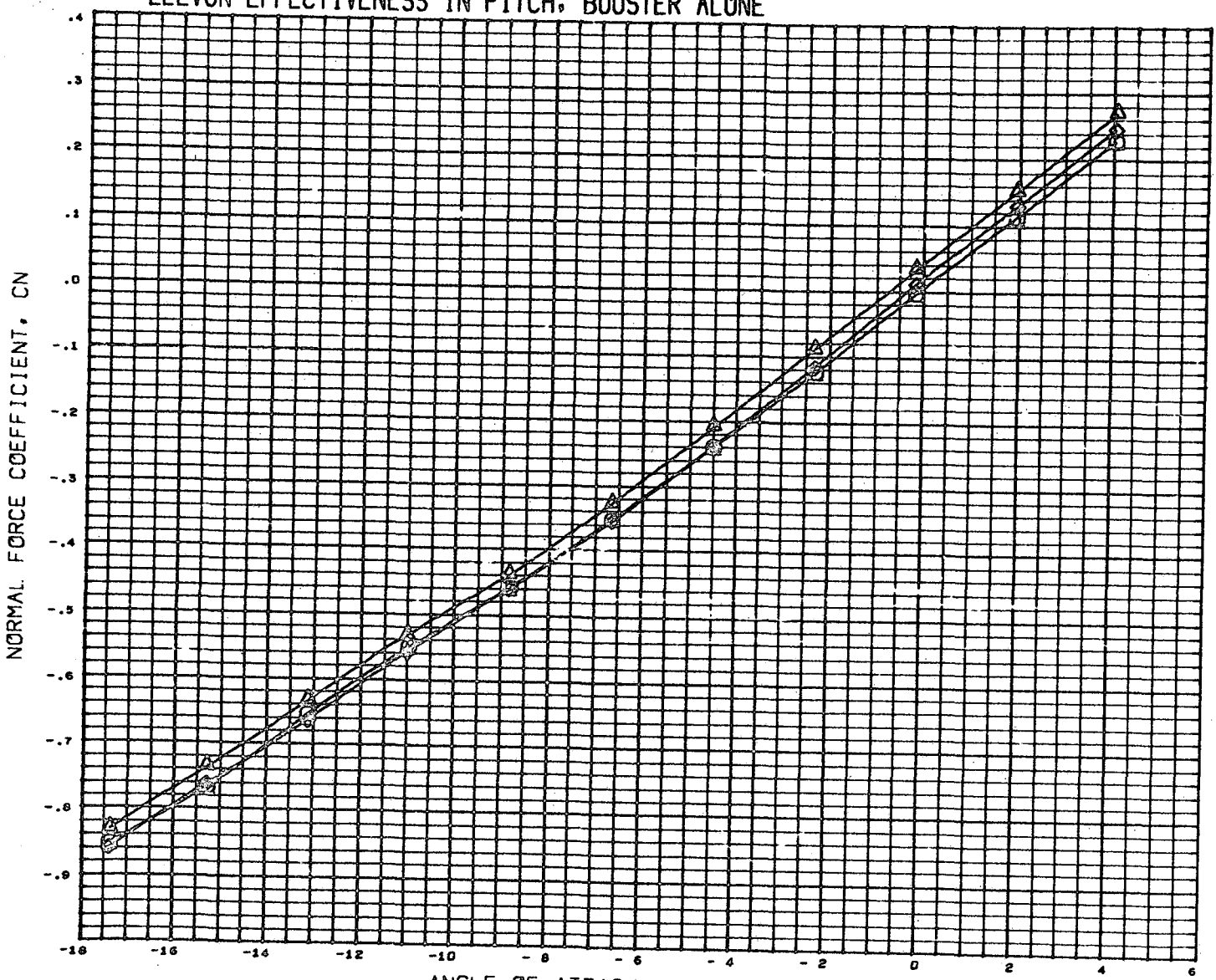
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	GRIT
(A3901B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	
(A3902B)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	54.000

MACH 4.959

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

ELEVON EFFECTIVENESS IN PITCH, BOOSTER ALONE



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(B3902A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3905A)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3906A)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

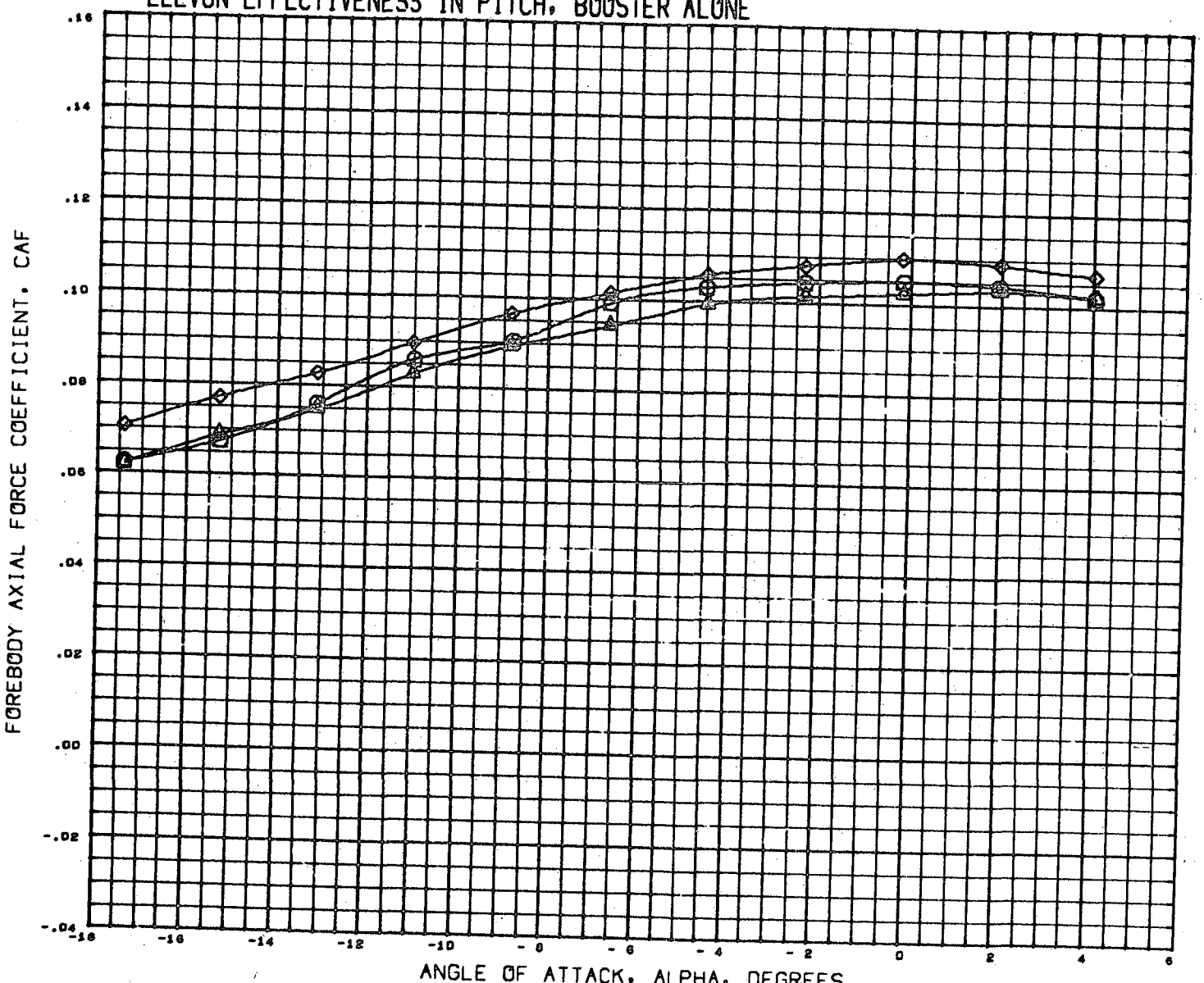
BETA	ELVATR	AILRON	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	-5.000	15.000	54.000

MACH 1.197

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

ELEVON EFFECTIVENESS IN PITCH, BOOSTER ALONE



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(B3902A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3905A)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3906A)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

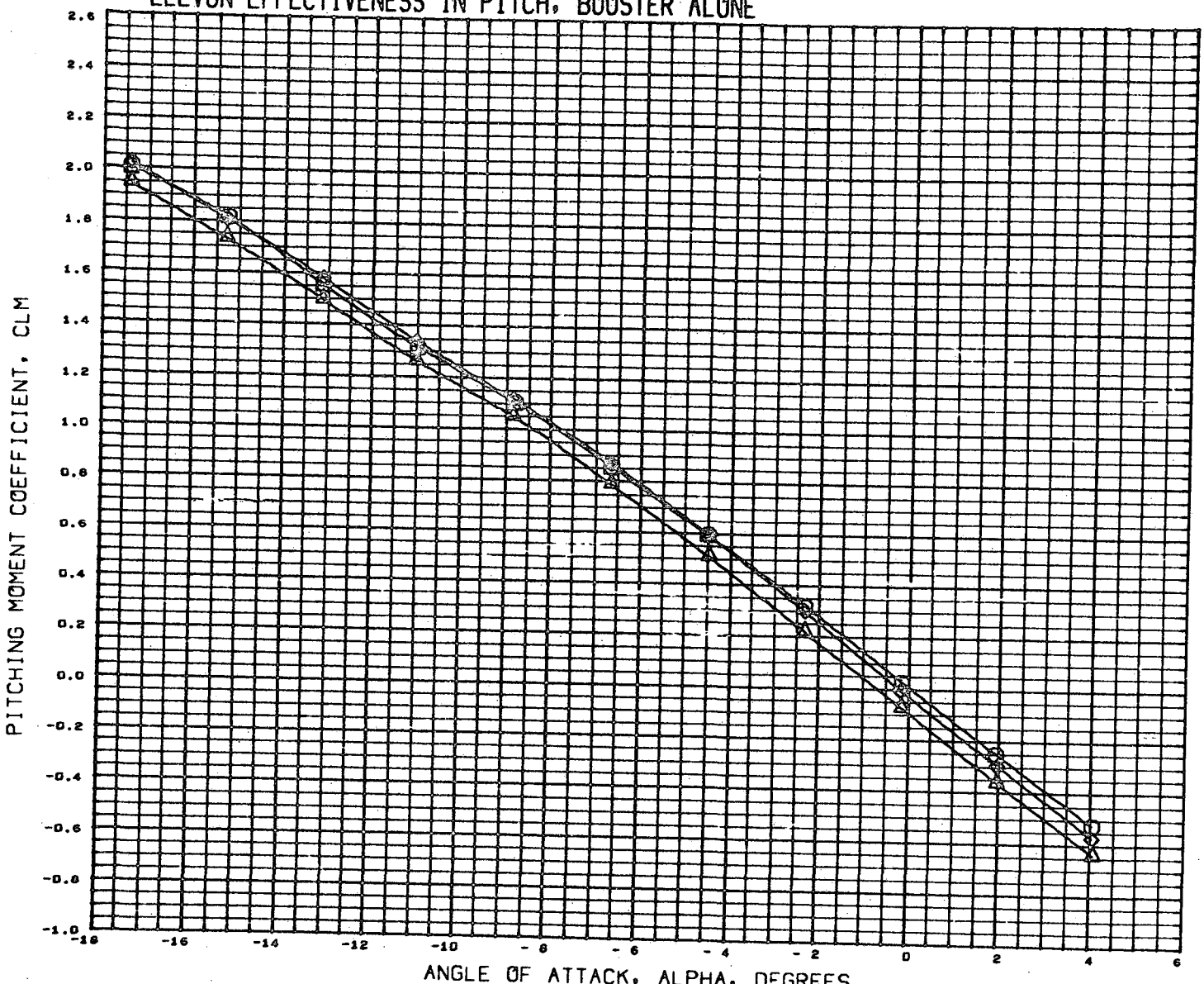
BETA	ELVATR	AILRON	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	-5.000	15.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.197

ELEVON EFFECTIVENESS IN PITCH, BOOSTER ALONE

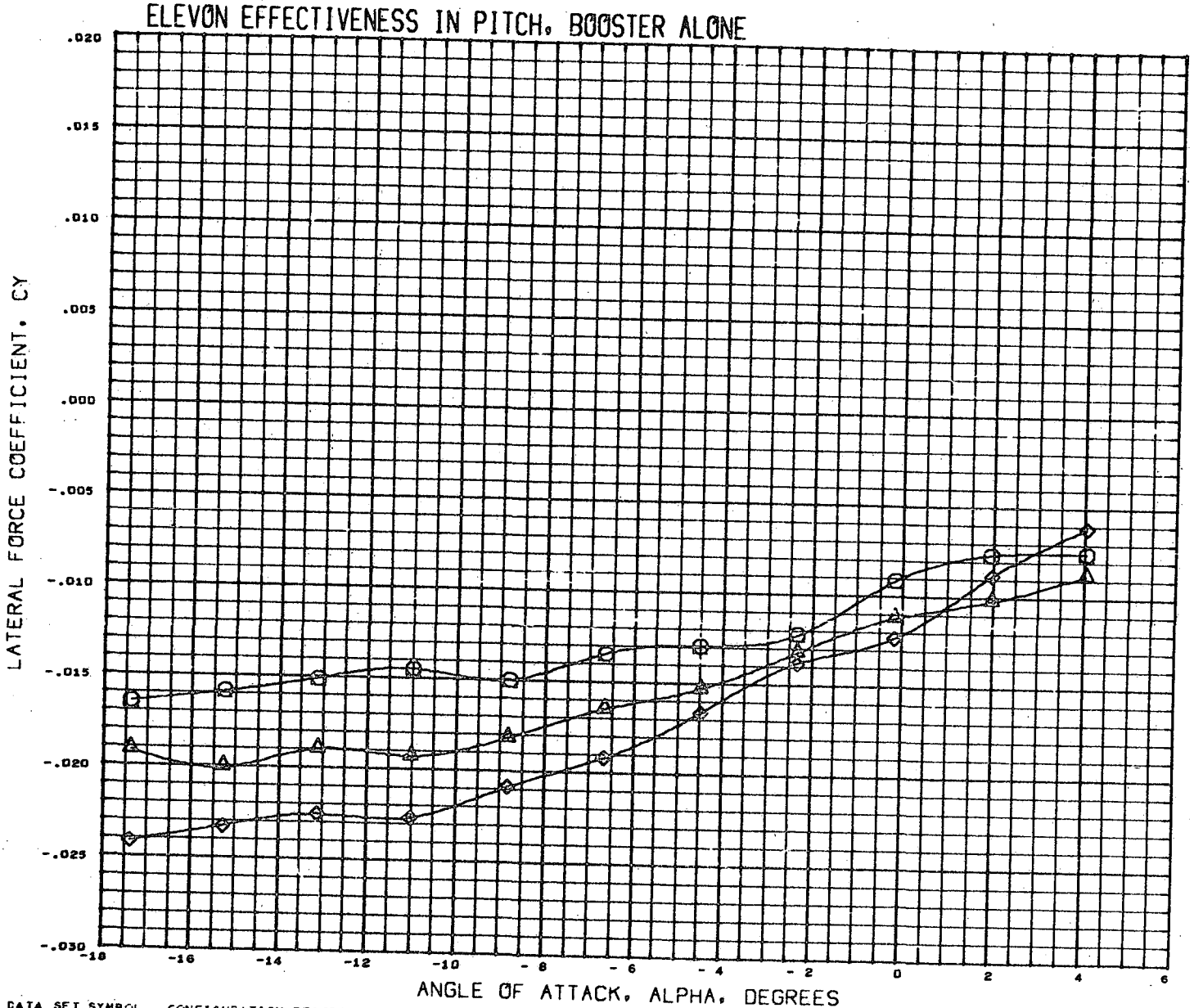


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(B3902A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3905A)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3906A)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

BETA	ELVATR	AILRON	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	-5.000	15.000	54.000

MACH 1.197

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE



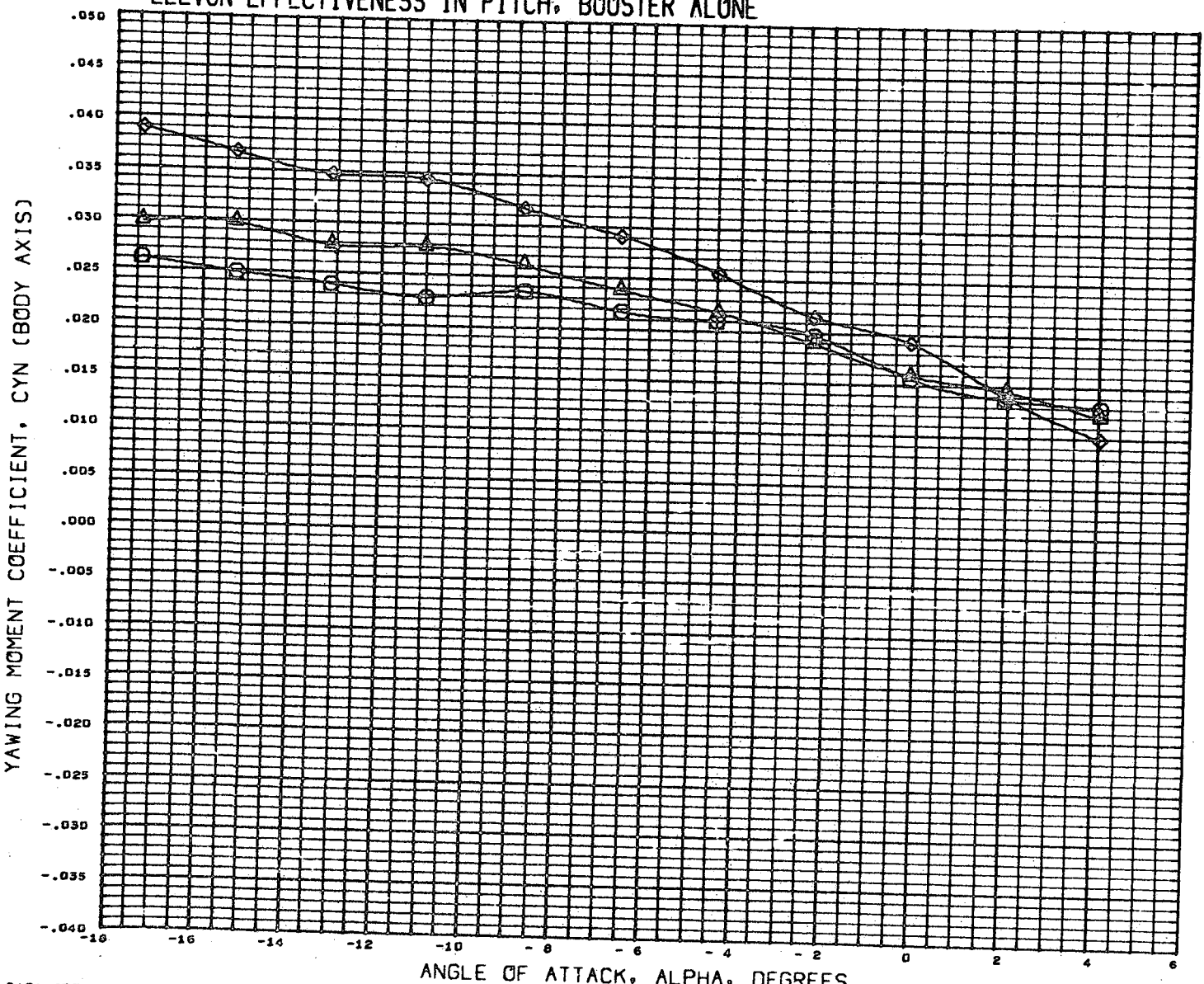
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(B39D2A)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A39G5A)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A39G6A)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

BETA	ELVATR	AILRON	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	-5.000	15.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.197

ELEVON EFFECTIVENESS IN PITCH, BOOSTER ALONE



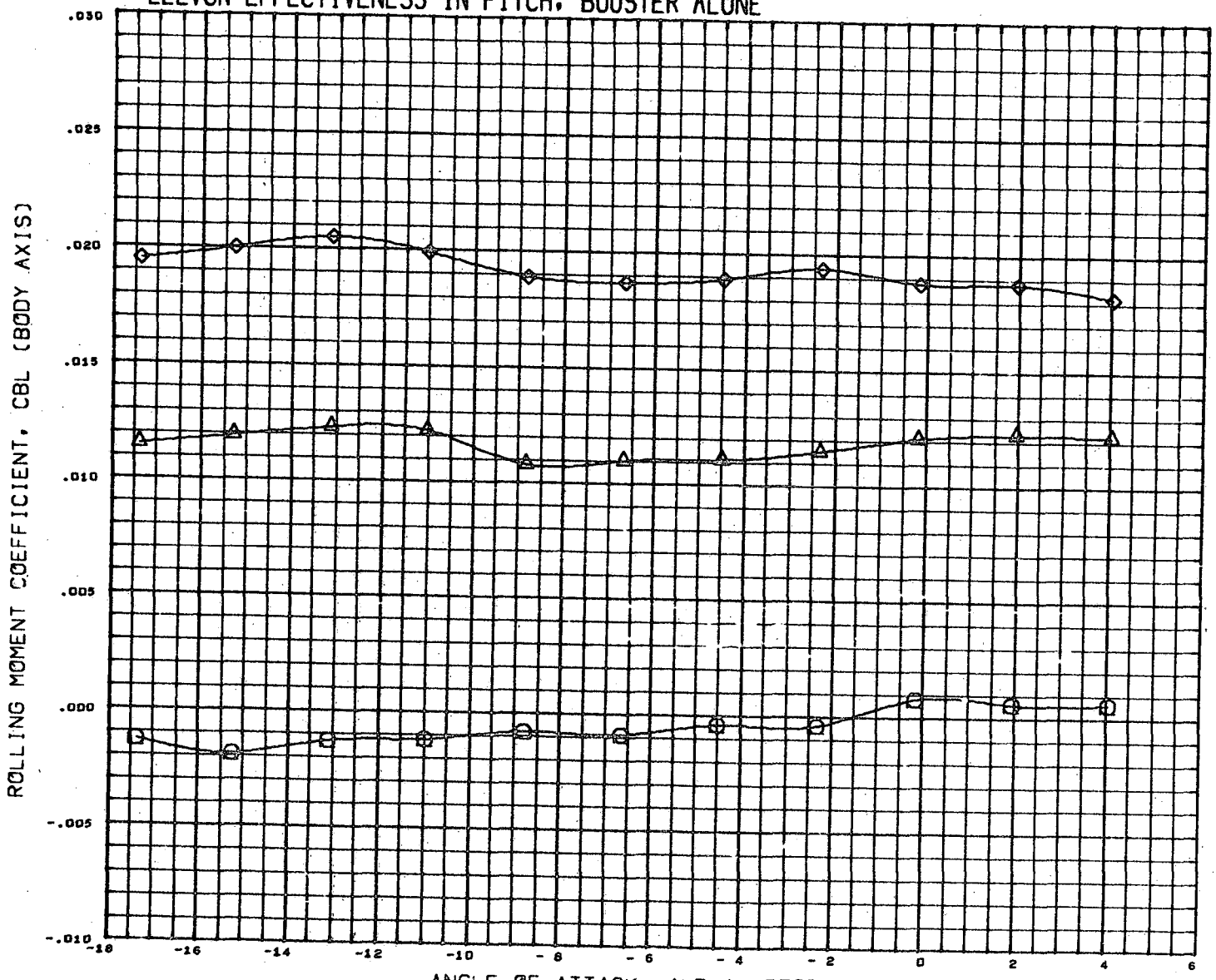
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(B3902A)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3905A)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3906A)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

BETA	ELVATR	AILRON	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	-5.000	15.000	54.000

MACH 1.197

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

ELEVON EFFECTIVENESS IN PITCH, BOOSTER ALONE



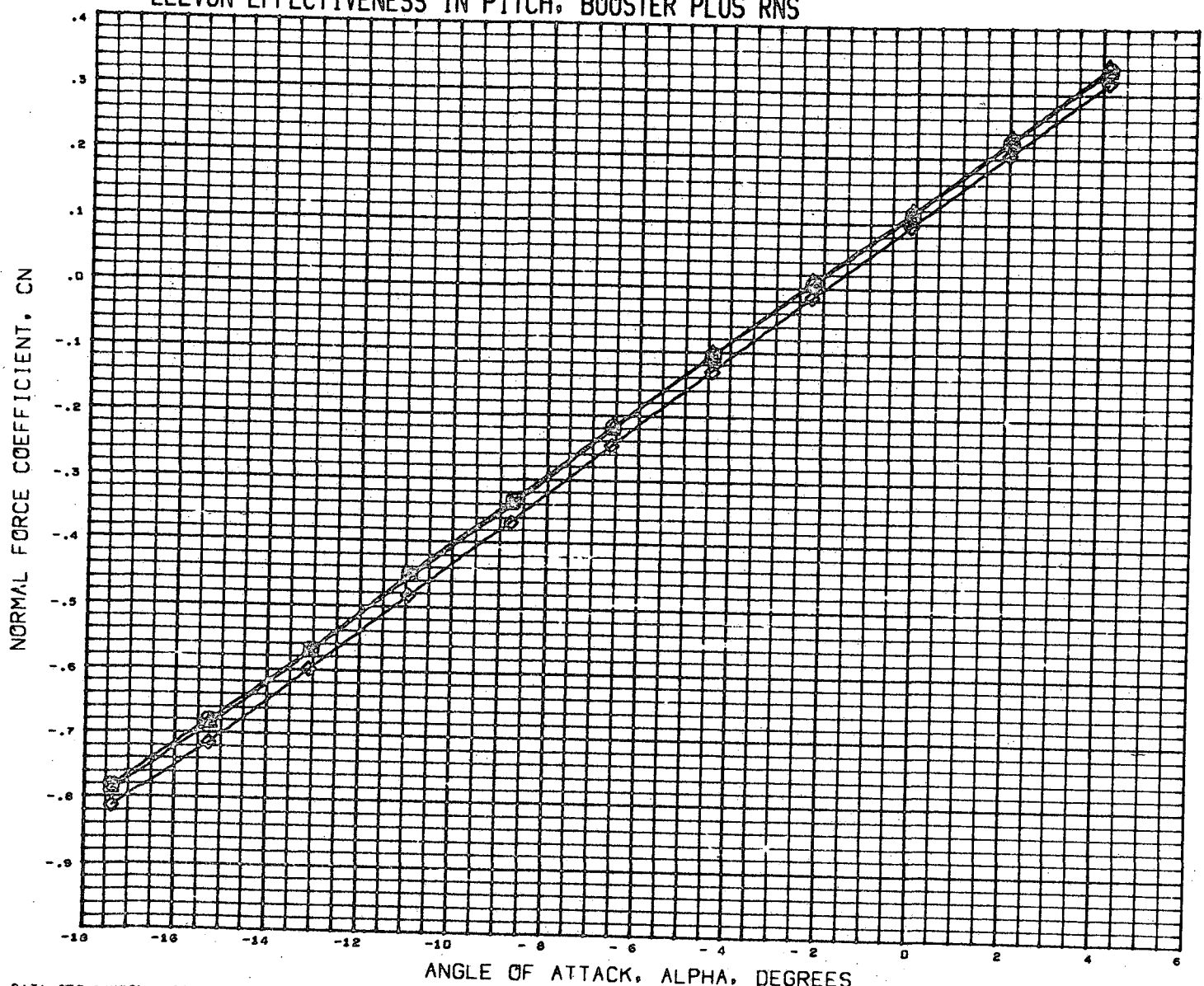
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(B39G2A) ○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A39G5A) △	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A39G6A) ◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

BETA	ELVATR	AILRON	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	-5.000	15.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.197

ELEVON EFFECTIVENESS IN PITCH, BOOSTER PLUS RNS



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(B3907A)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(A3908A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(A3909A)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

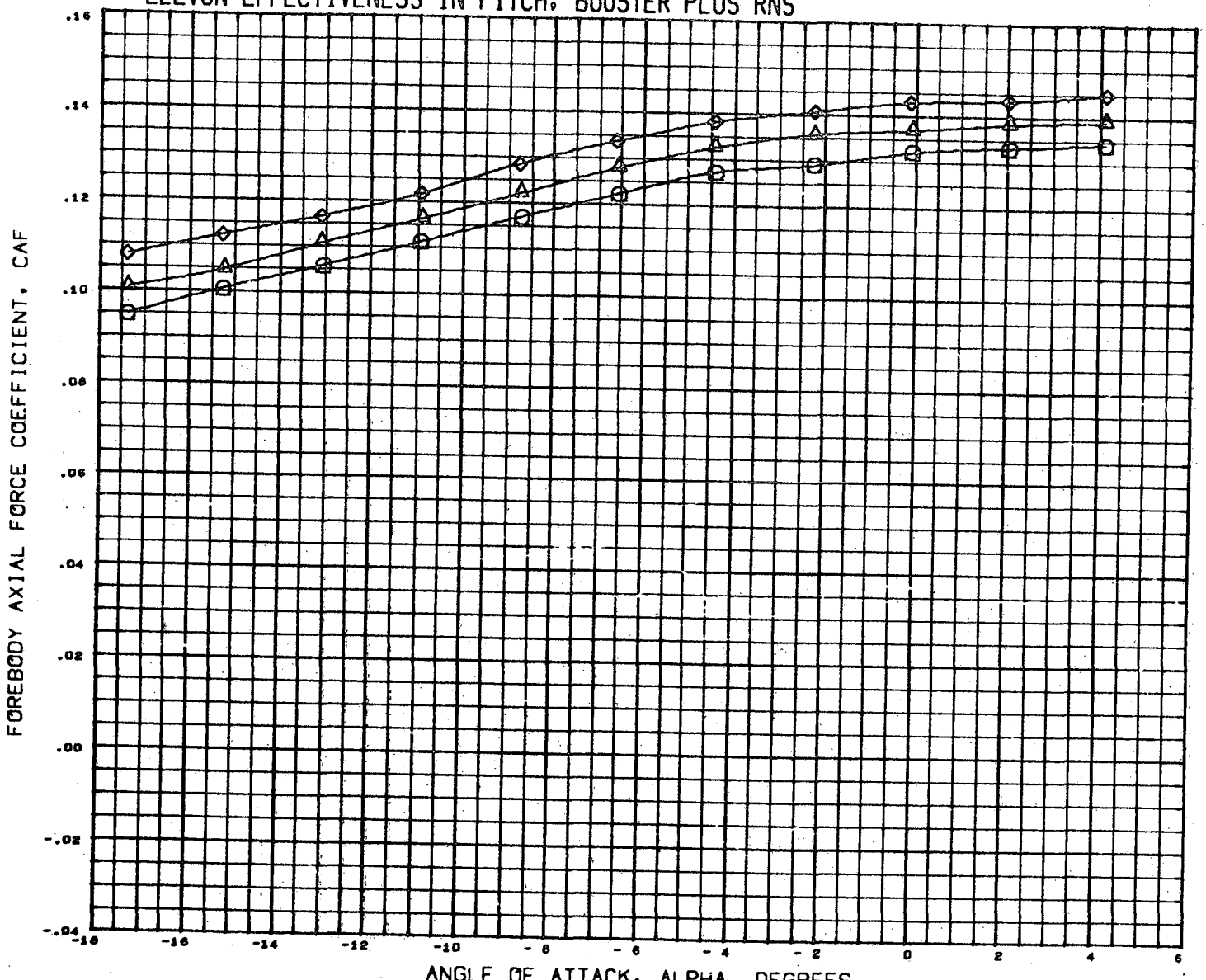
BETA	ELVATR	AILRON	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	-5.000	15.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.194

ELEVON EFFECTIVENESS IN PITCH, BOOSTER PLUS RNS

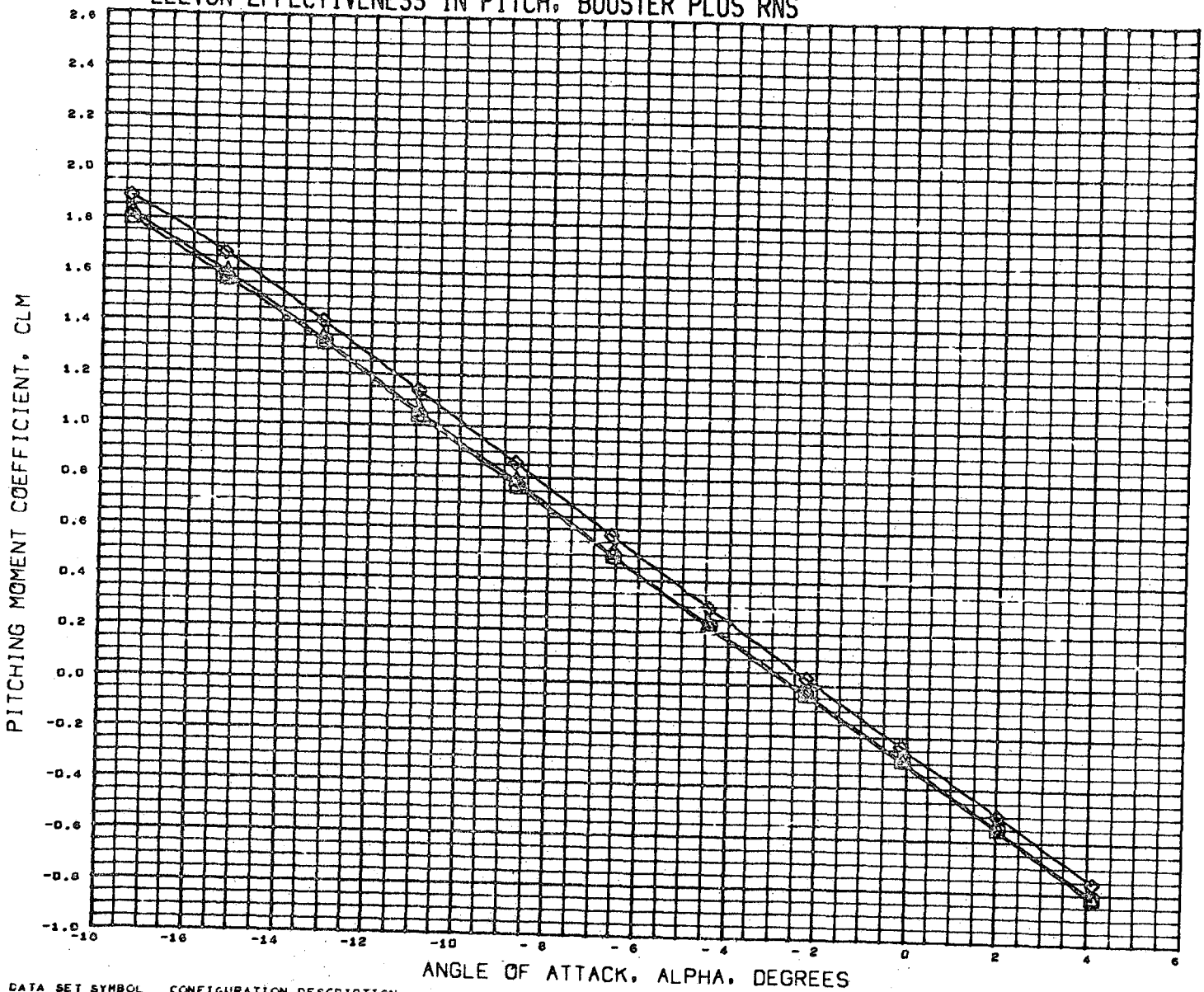


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVATR	AILRON	GRIT
(B3907A)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	0.000	0.000	54.000
(A3908A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	0.000	10.000	54.000
(A3909A)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	-5.000	15.000	54.000

MACH 1.194

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRF	0.0000	
SCALE	0.0031	SCALE

ELEVON EFFECTIVENESS IN PITCH, BOOSTER PLUS RNS



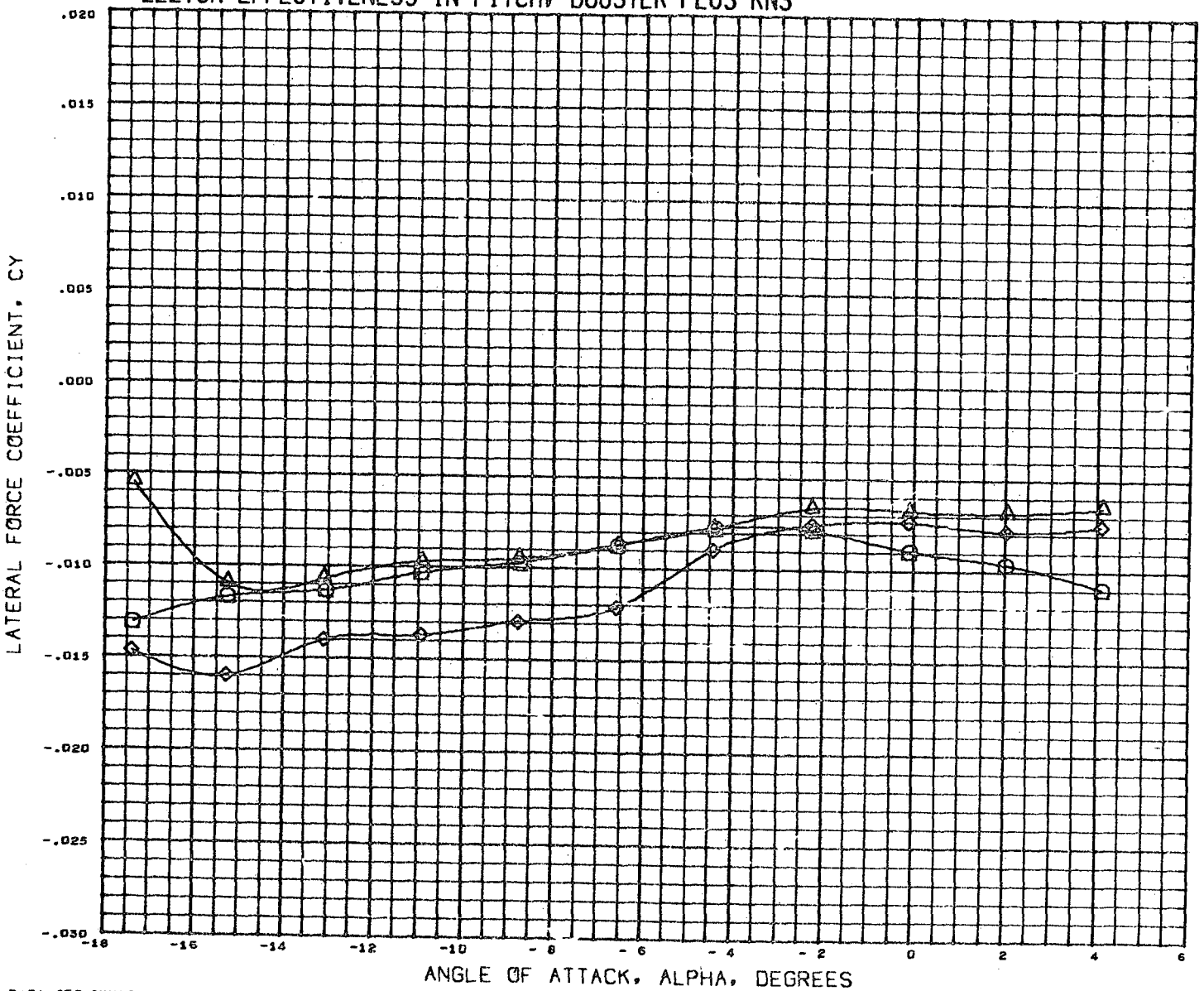
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(B3907A)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(A3908A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(A3909A)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

BETA	ELVATR	AILRON	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	-5.000	15.000	54.000

MACH 1.194

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

ELEVON EFFECTIVENESS IN PITCH, BOOSTER PLUS RNS

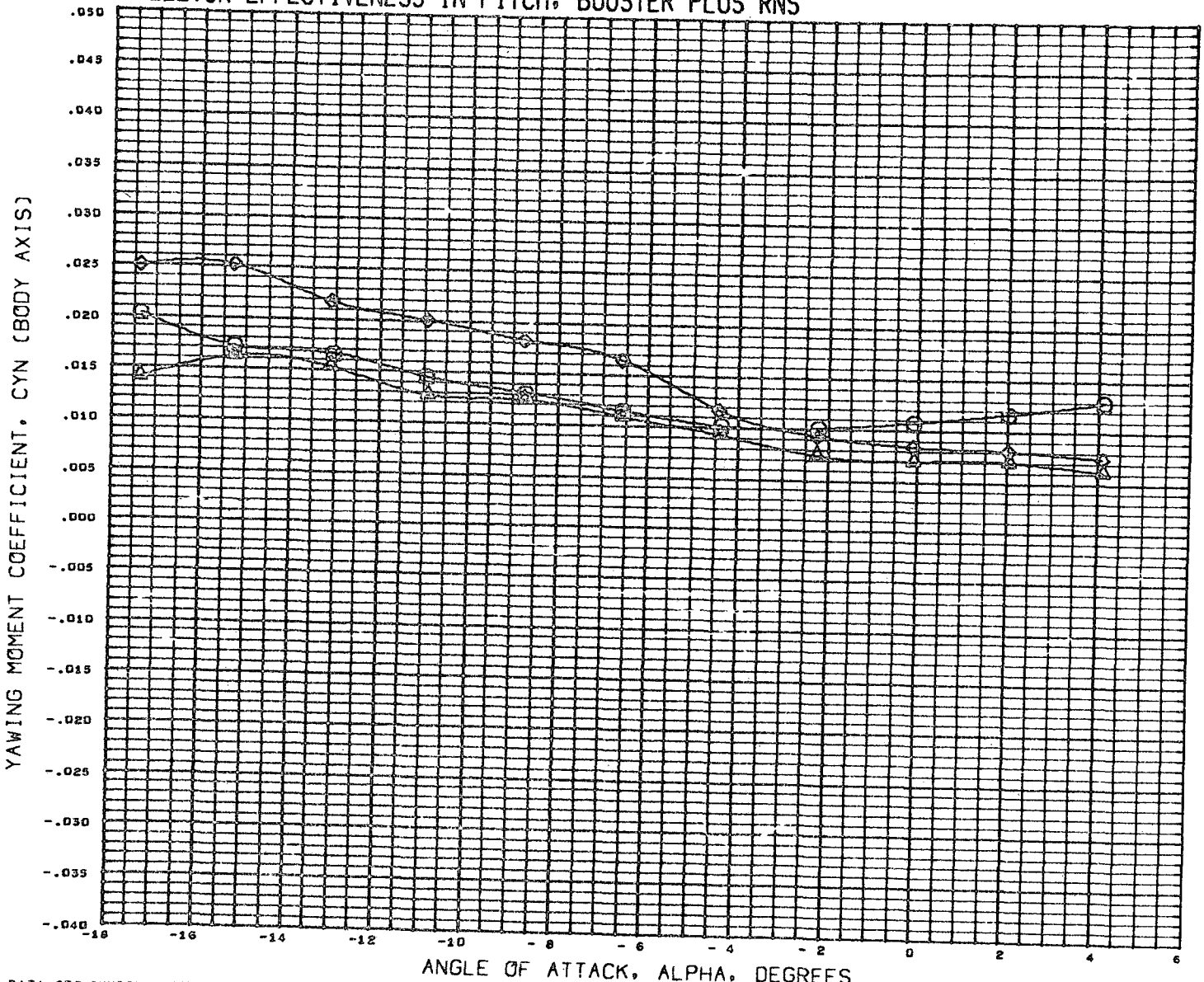


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVATR	AILRON	GRIT
(B3907A)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	0.000	0.000	54.000
(A3908A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	0.000	10.000	54.000
(A3909A)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	-5.000	15.000	54.000

MACH 1.194

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

ELEVON EFFECTIVENESS IN PITCH, BOOSTER PLUS RNS



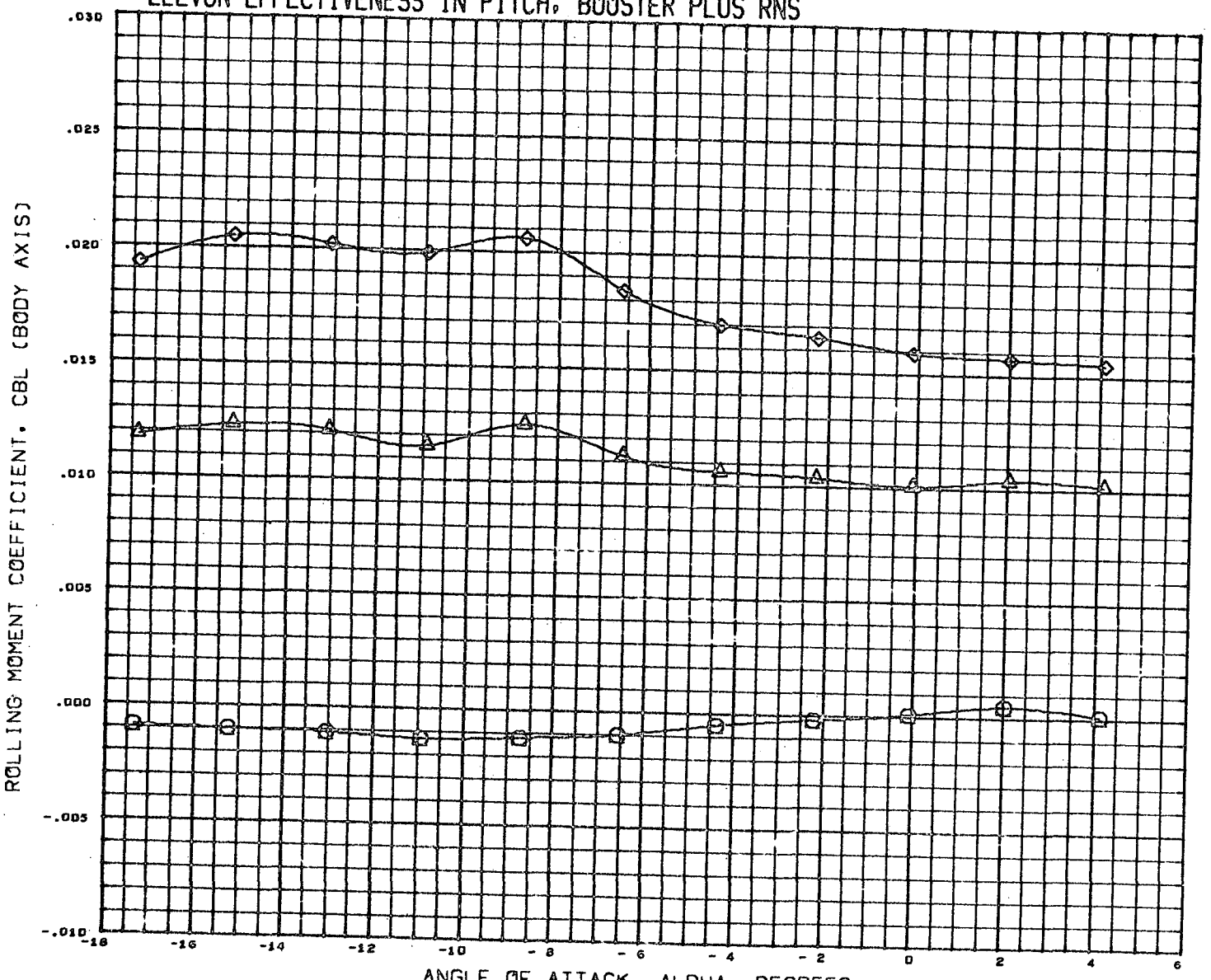
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(B3907A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(A3908A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(A3909A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

BETA	ELVATR	AILRON	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	-5.000	15.000	54.000

MACH 1.194

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

ELEVON EFFECTIVENESS IN PITCH, BOOSTER PLUS RNS



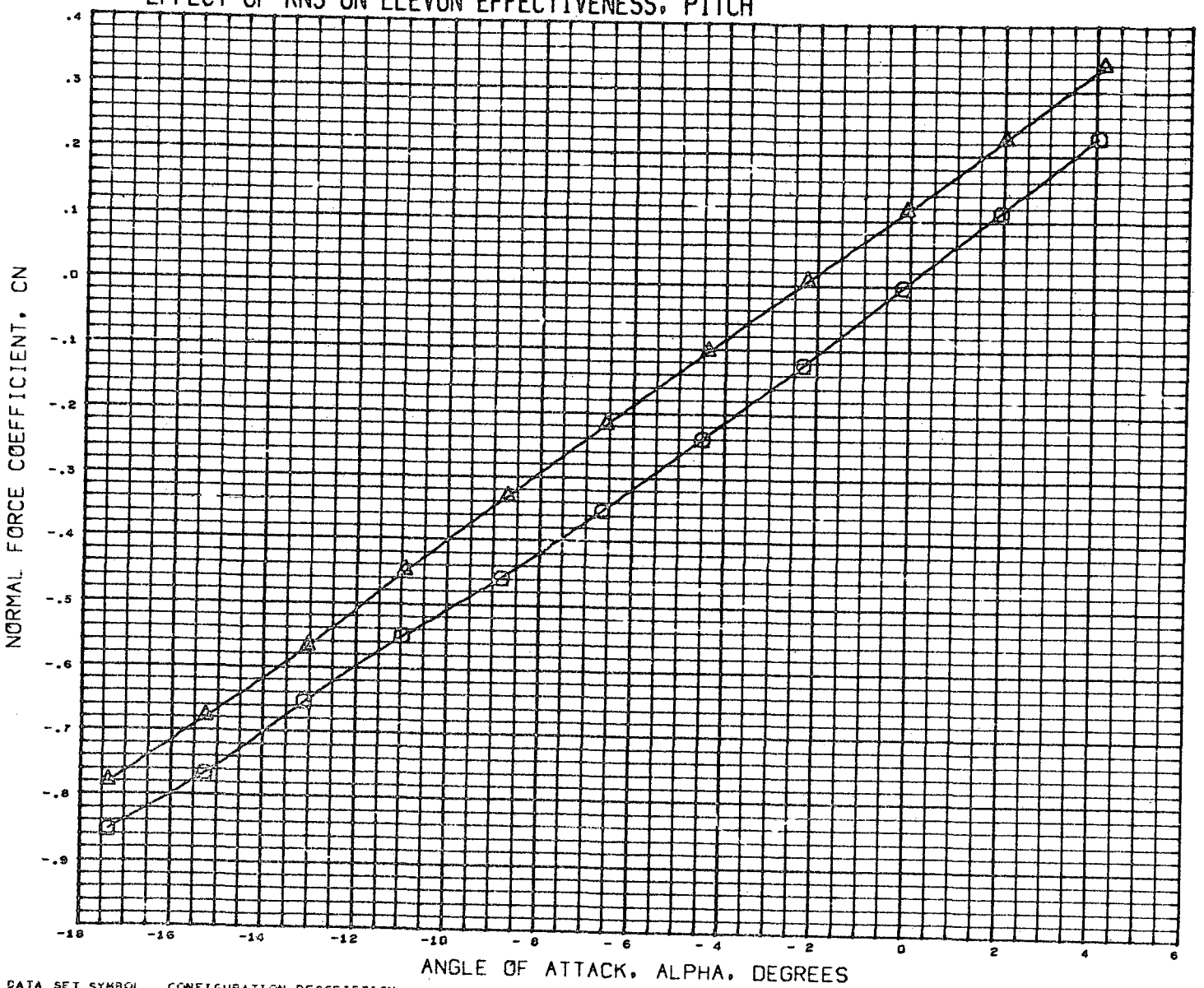
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(B3907A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(A3908A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(A3909A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

BETA	ELVATR	AILRON	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	-5.000	15.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.194

EFFECT OF RNS ON ELEVON EFFECTIVENESS, PITCH



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(B39D2A)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(B3907A)		MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

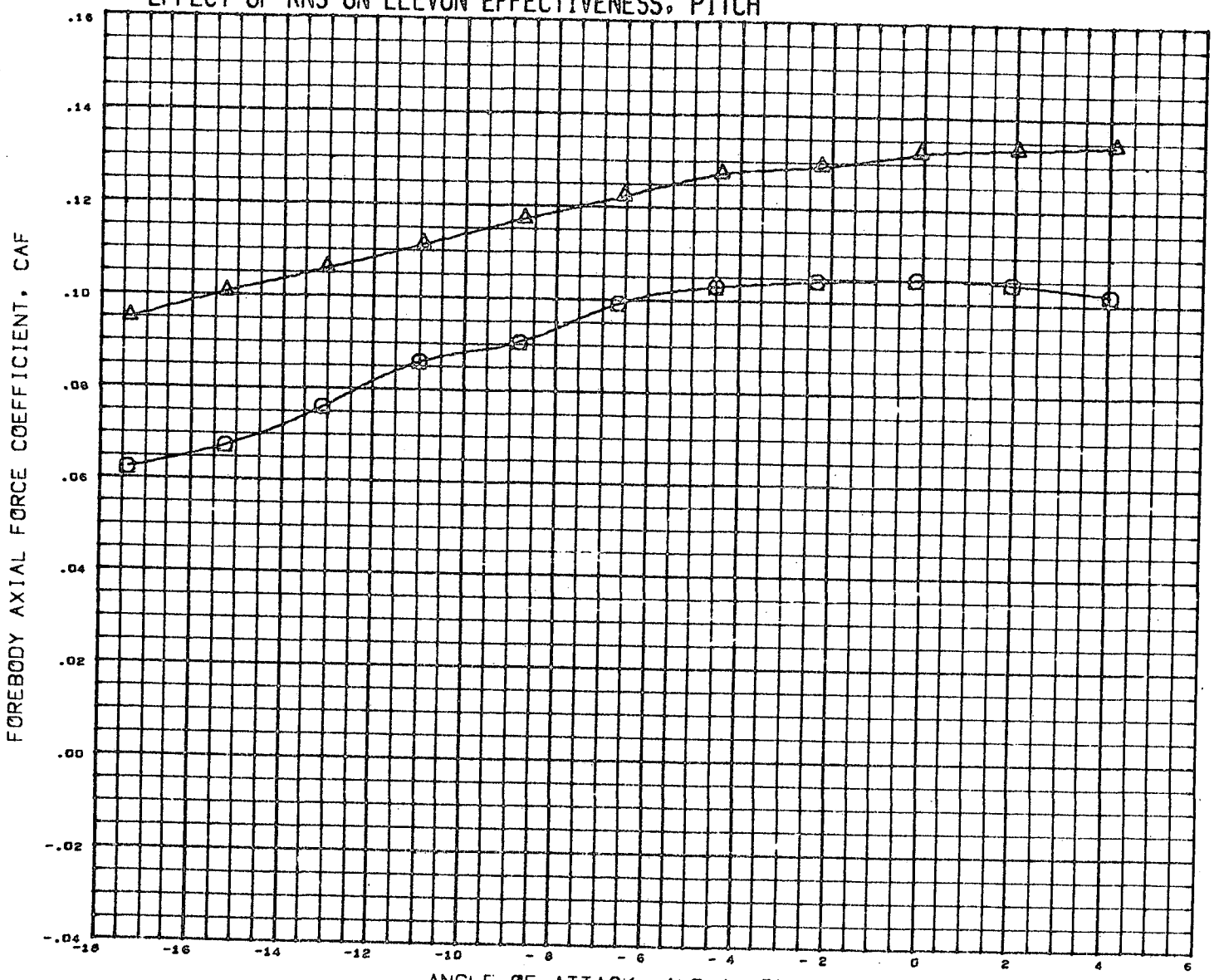
BETA	ELVATR	AILRON	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	0.000	54.000

MACH 1.197

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF RNS ON ELEVON EFFECTIVENESS, PITCH



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(B3902A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(B3907A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

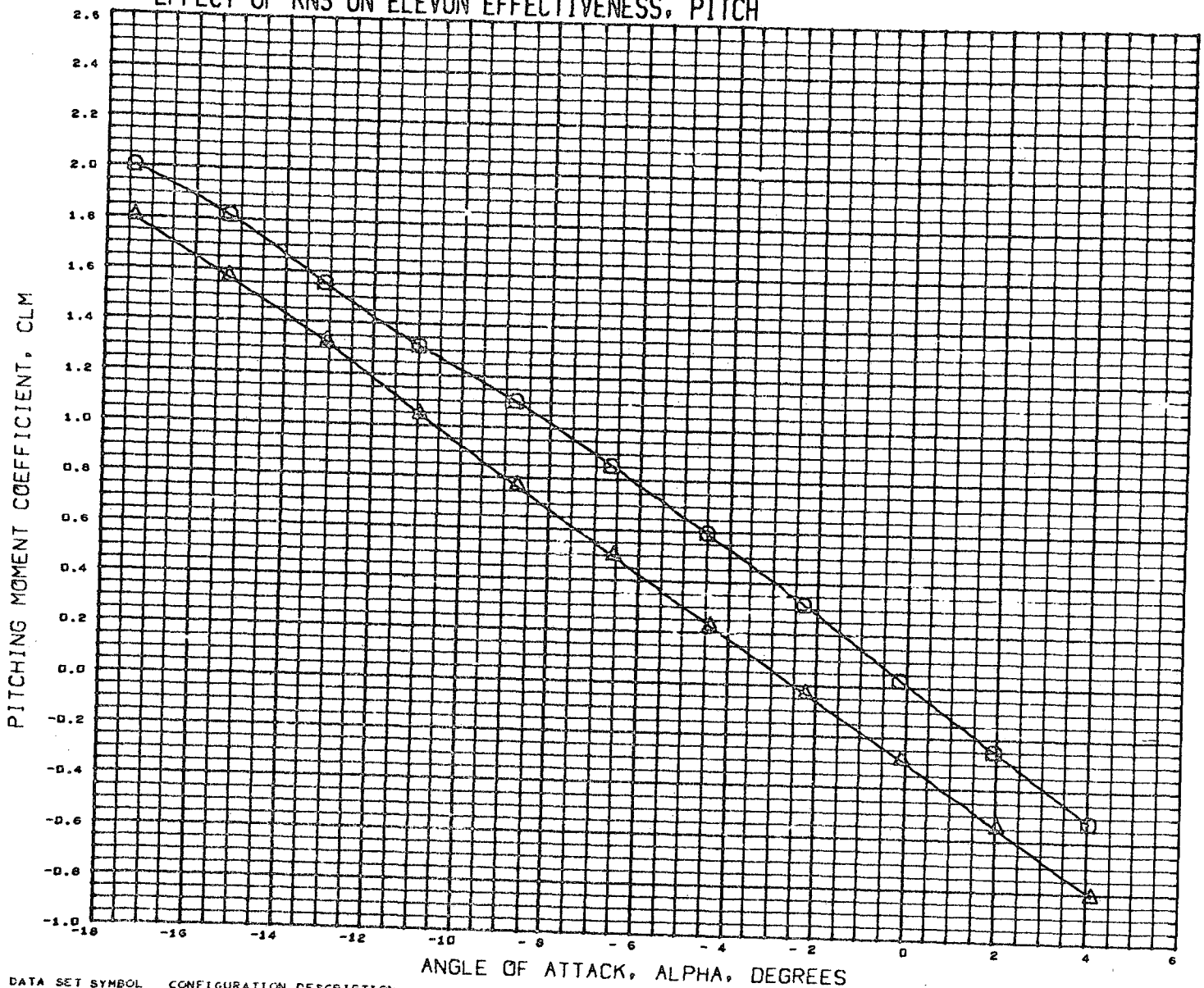
BETA	ELVATR	AILRON	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	0.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.197

EFFECT OF RNS ON ELEVON EFFECTIVENESS, PITCH



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(B3902A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(B3907A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

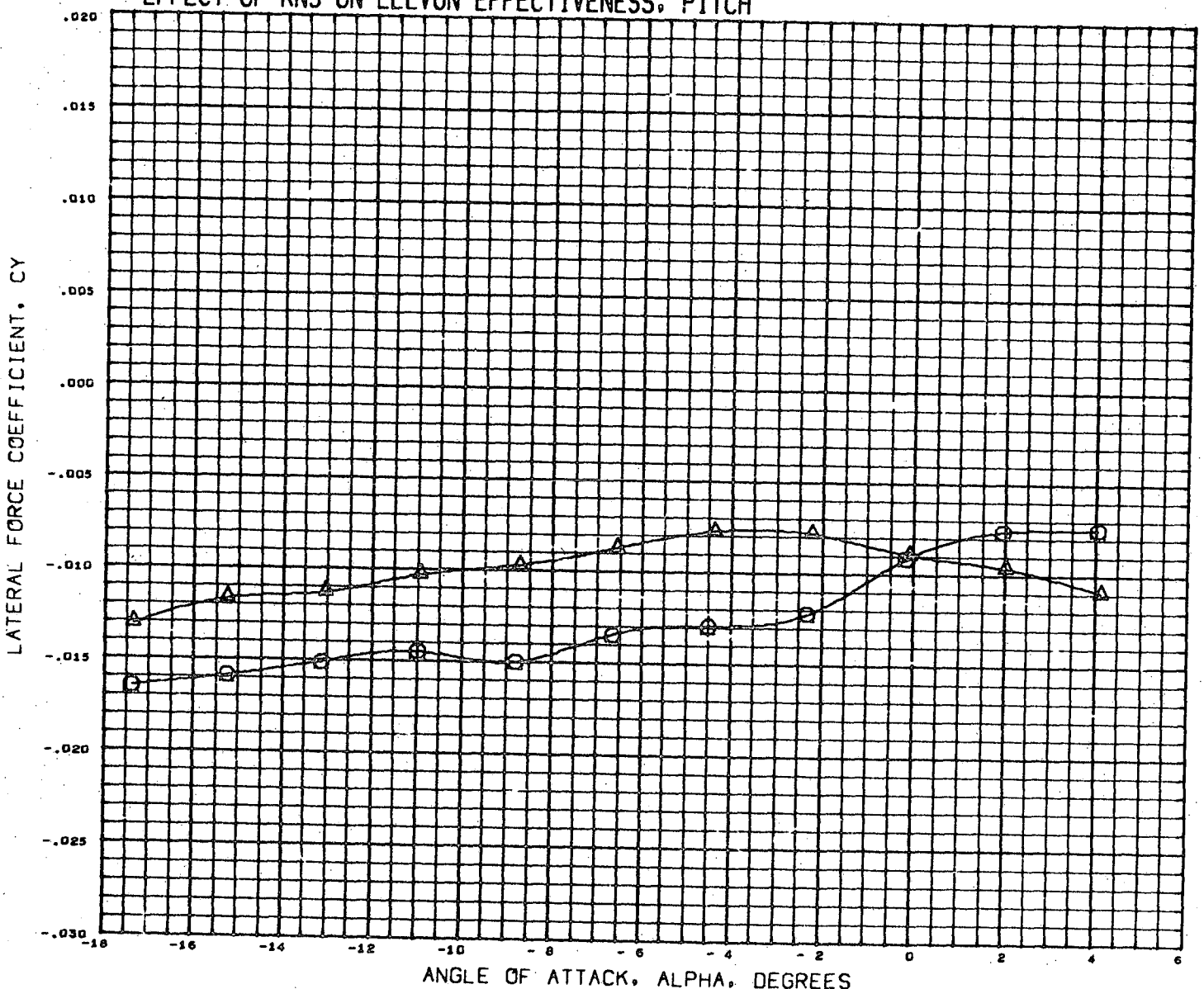
BETA	ELVATR	AILRON	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	0.000	54.000

MACH 1.197

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF RNS ON ELEVON EFFECTIVENESS, PITCH



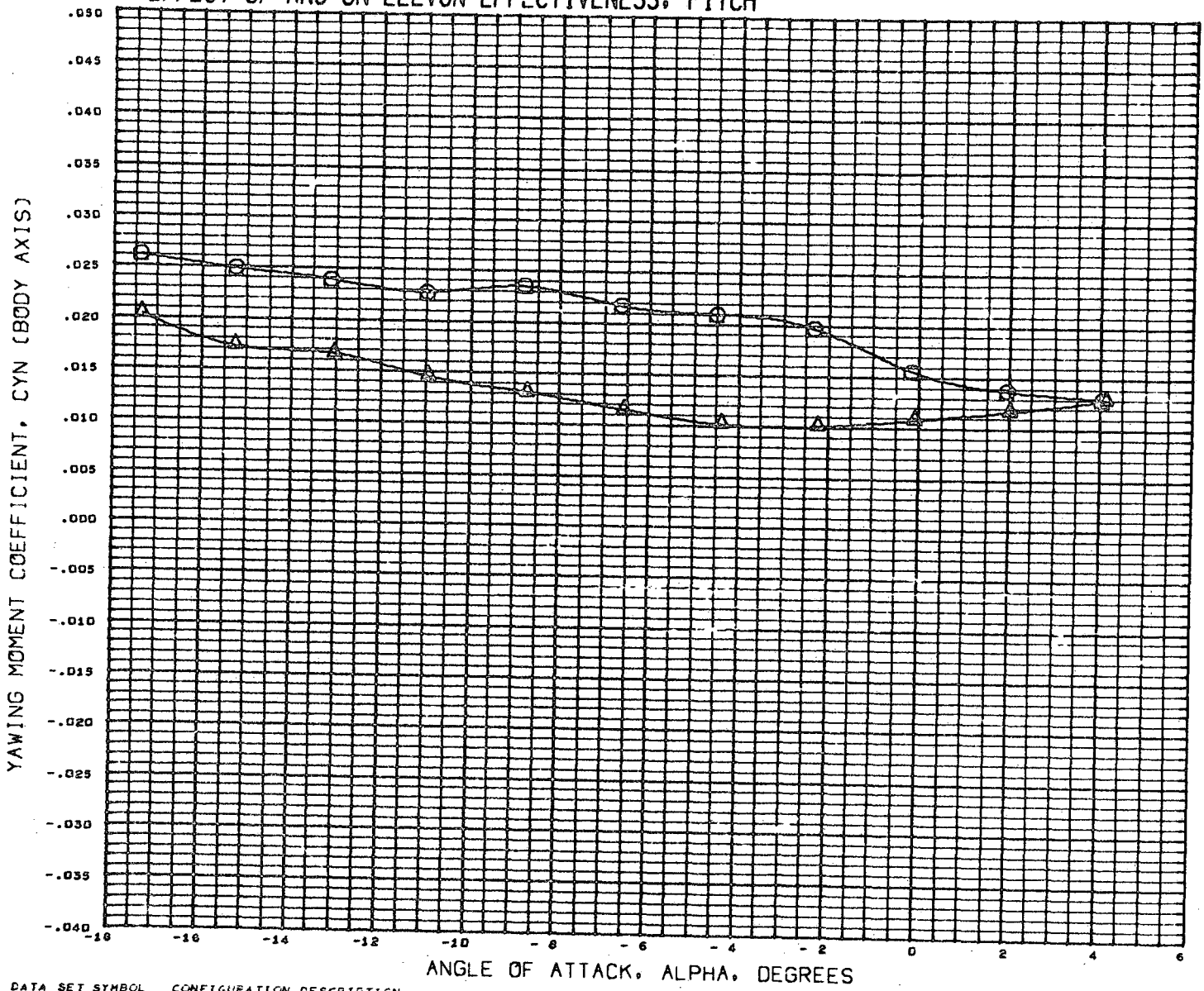
DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(B3902A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(B3907A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

BETA	ELVATR	AILRON	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	0.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.197

EFFECT OF RNS ON ELEVON EFFECTIVENESS, PITCH



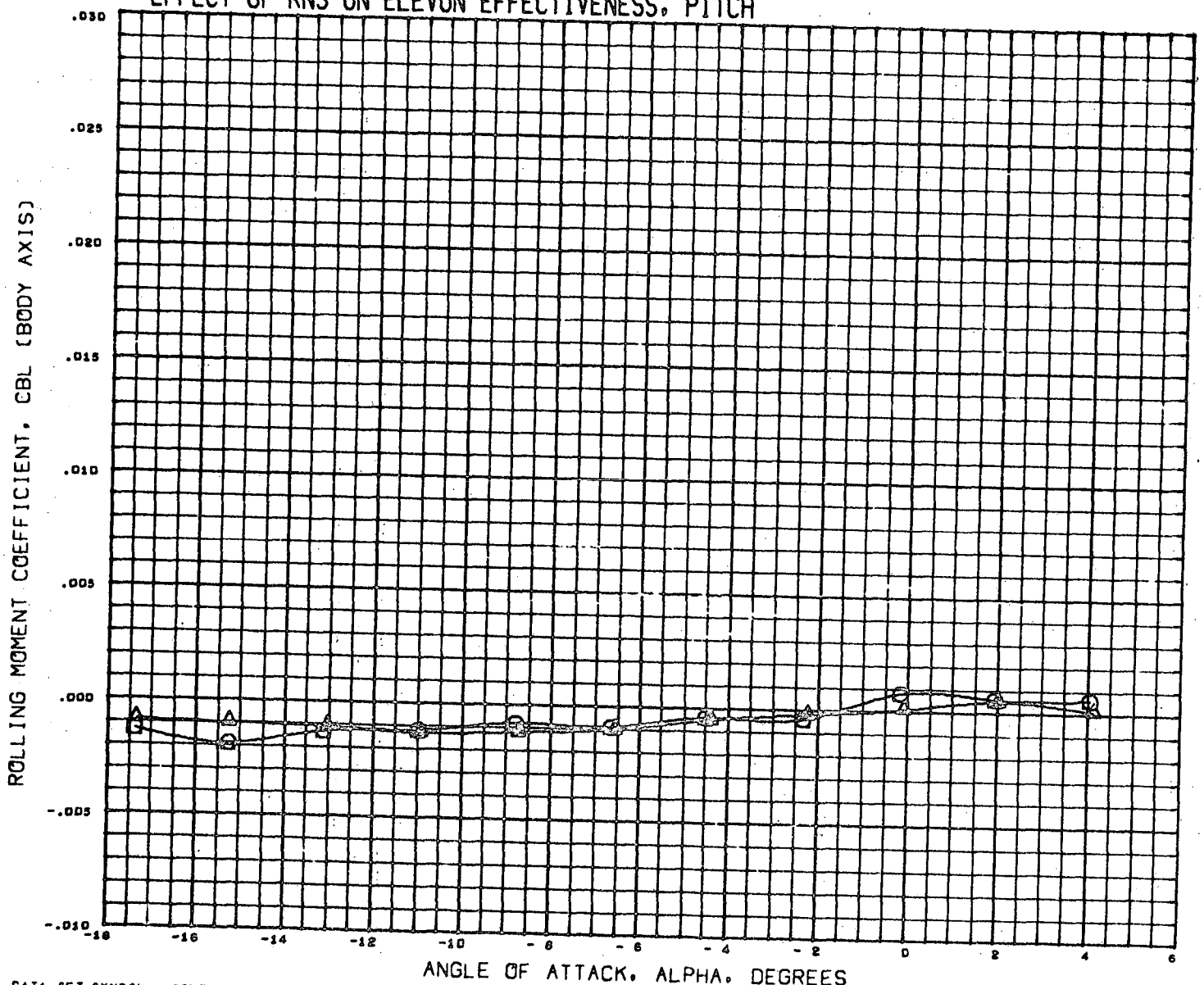
DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(B39D2A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(B39D7A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

	BETA	ELVATR	AILRON	GRIT
	0.000	0.000	0.000	54.000
	0.000	0.000	0.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.197

EFFECT OF RNS ON ELEVON EFFECTIVENESS, PITCH



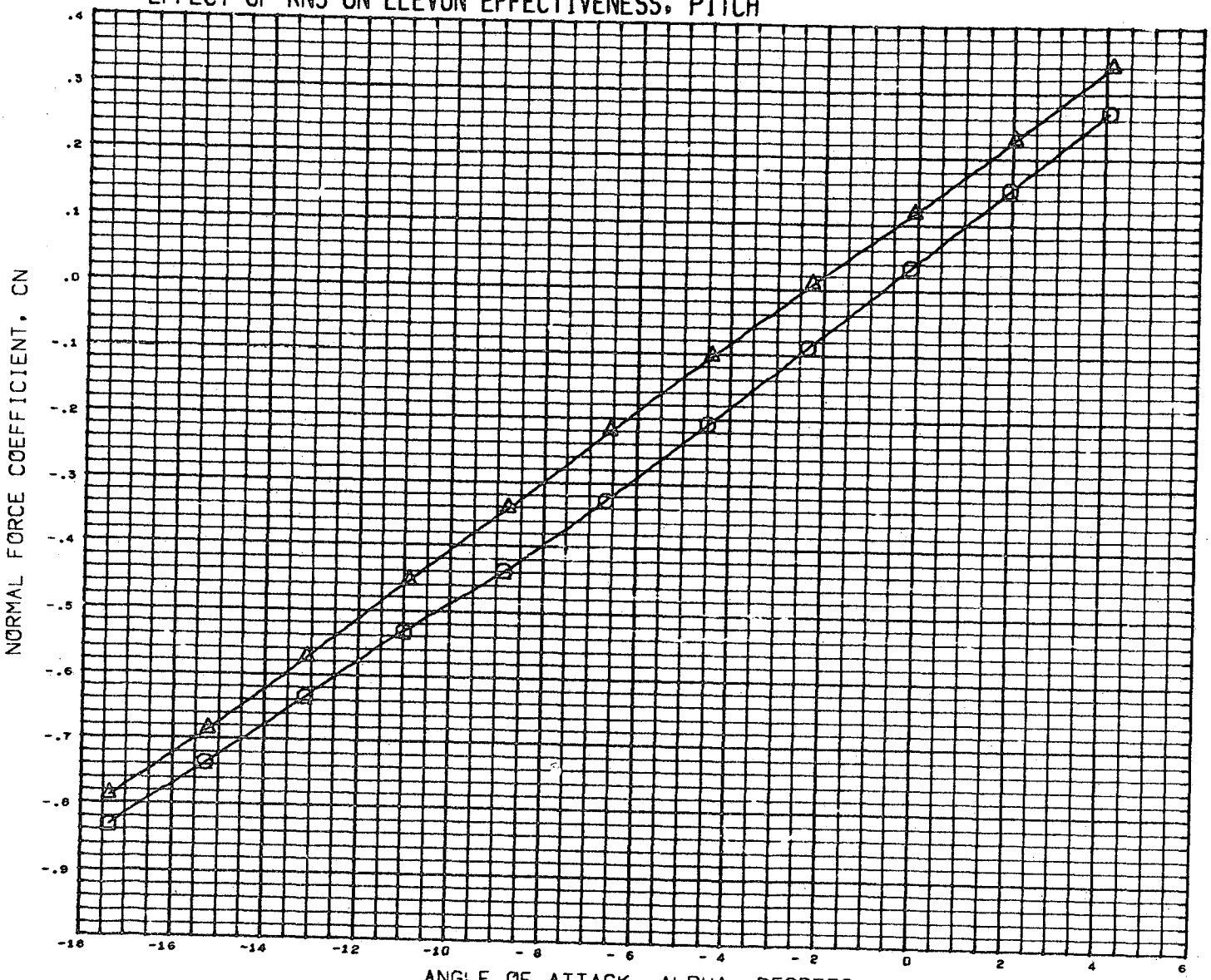
DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(B3902A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(B3907A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

BETA	ELVATR	AILRON	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	0.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.197

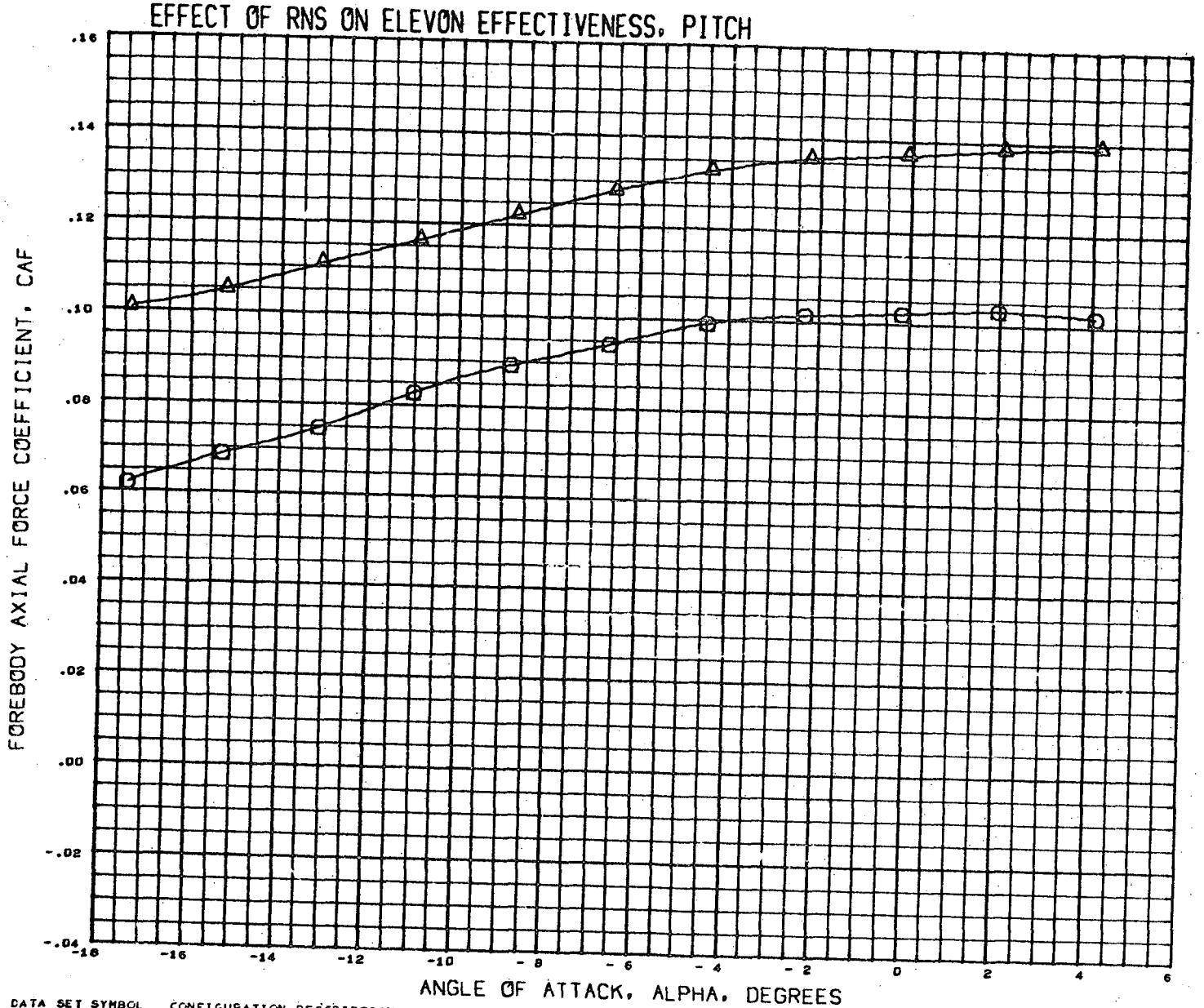
EFFECT OF RNS ON ELEVON EFFECTIVENESS, PITCH



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVATR	AILRON	GRIT
(A3905A)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	0.000	0.000	10.000	54.000
(A3908A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	0.000	10.000	54.000

MACH 1.189

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE



DATA SET SYMBOL CONFIGURATION DESCRIPTION

(A3905A) MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

(A3908A) MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

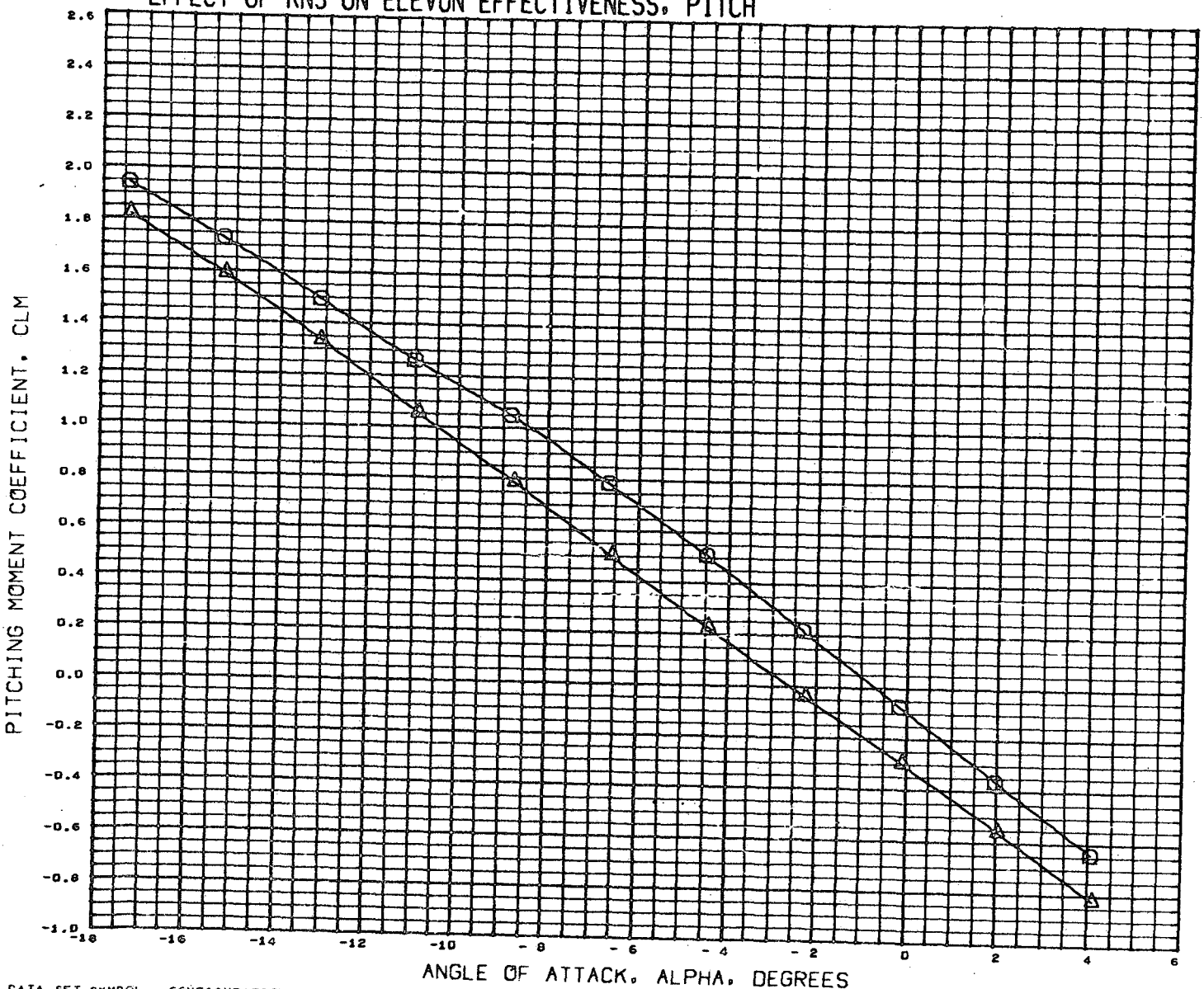
BETA	ELVATR	AILRON	GRIT
0.000	0.000	10.000	54.000
0.000	0.000	10.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.189

EFFECT OF RNS ON ELEVON EFFECTIVENESS, PITCH

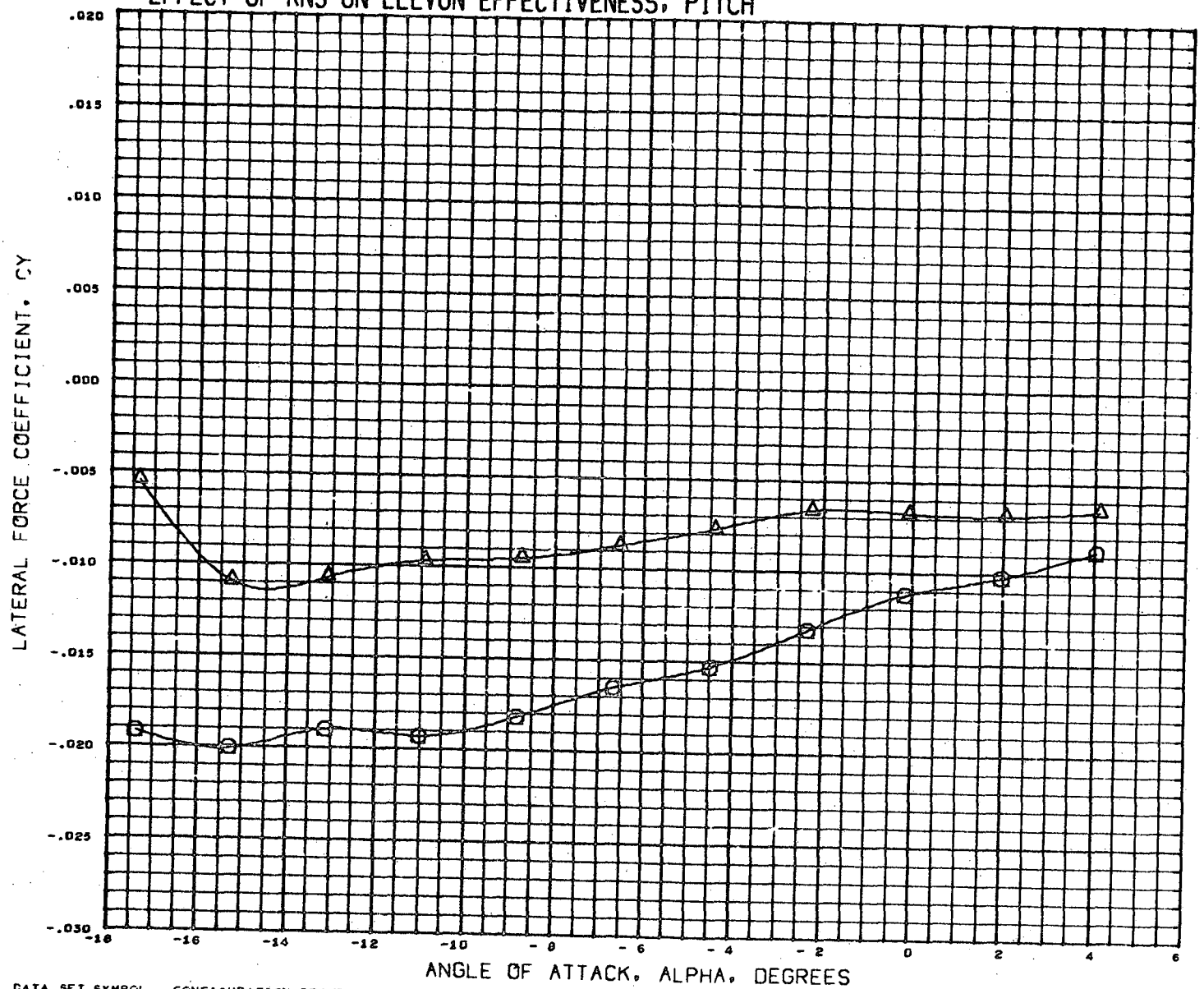


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVATR	AILRON	GRIT
(A3905A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	0.000	0.000	10.000	54.000
(A3908A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	0.000	10.000	54.000

MACH 1.189

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF RNS ON ELEVON EFFECTIVENESS, PITCH



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(A3905A)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3908A)		MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

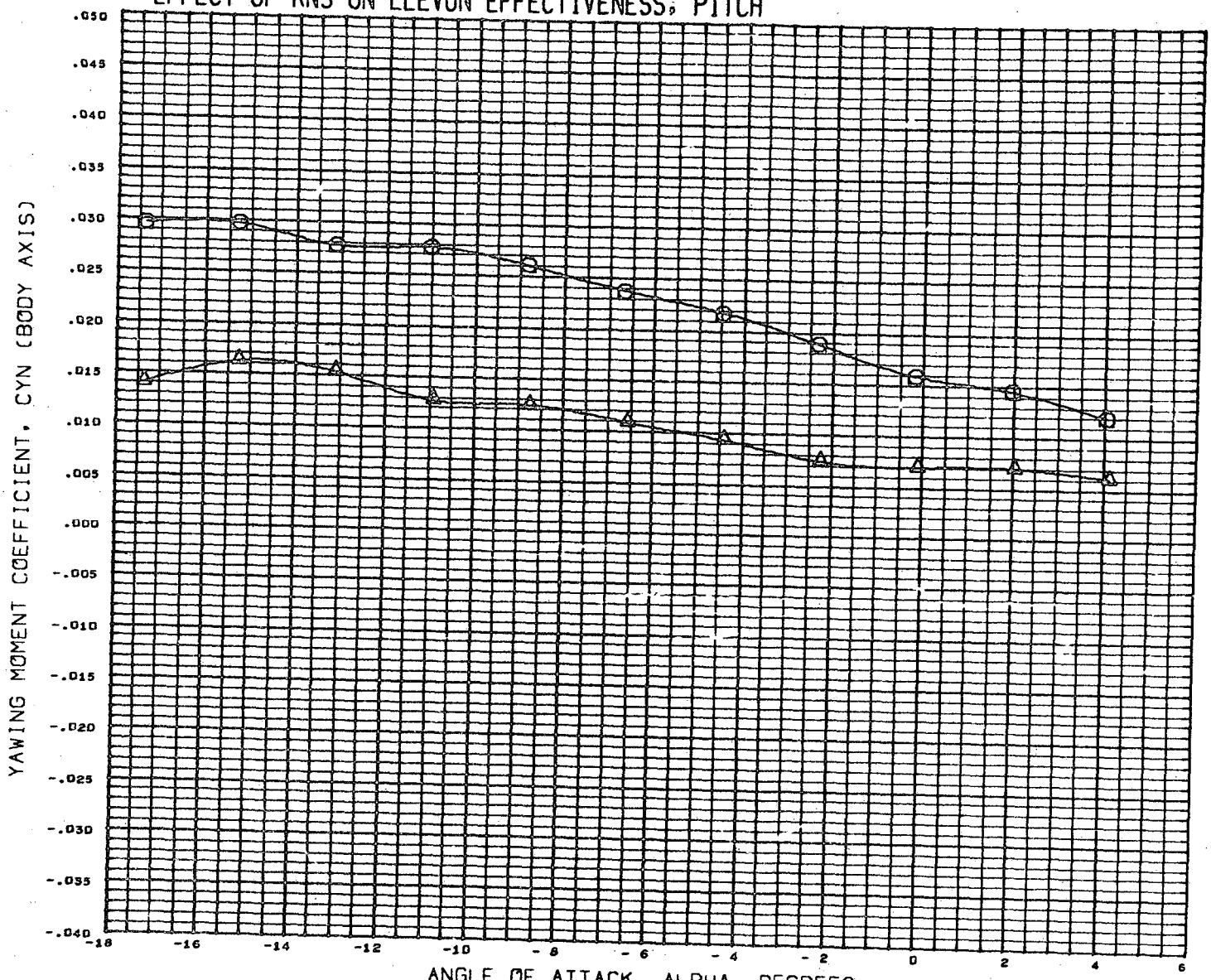
BETA	ELVATR	AILRON	GRIT
0.000	0.000	10.000	54.000
0.000	0.000	10.000	54.000

MACH 1.189

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF RNS ON ELEVON EFFECTIVENESS, PITCH

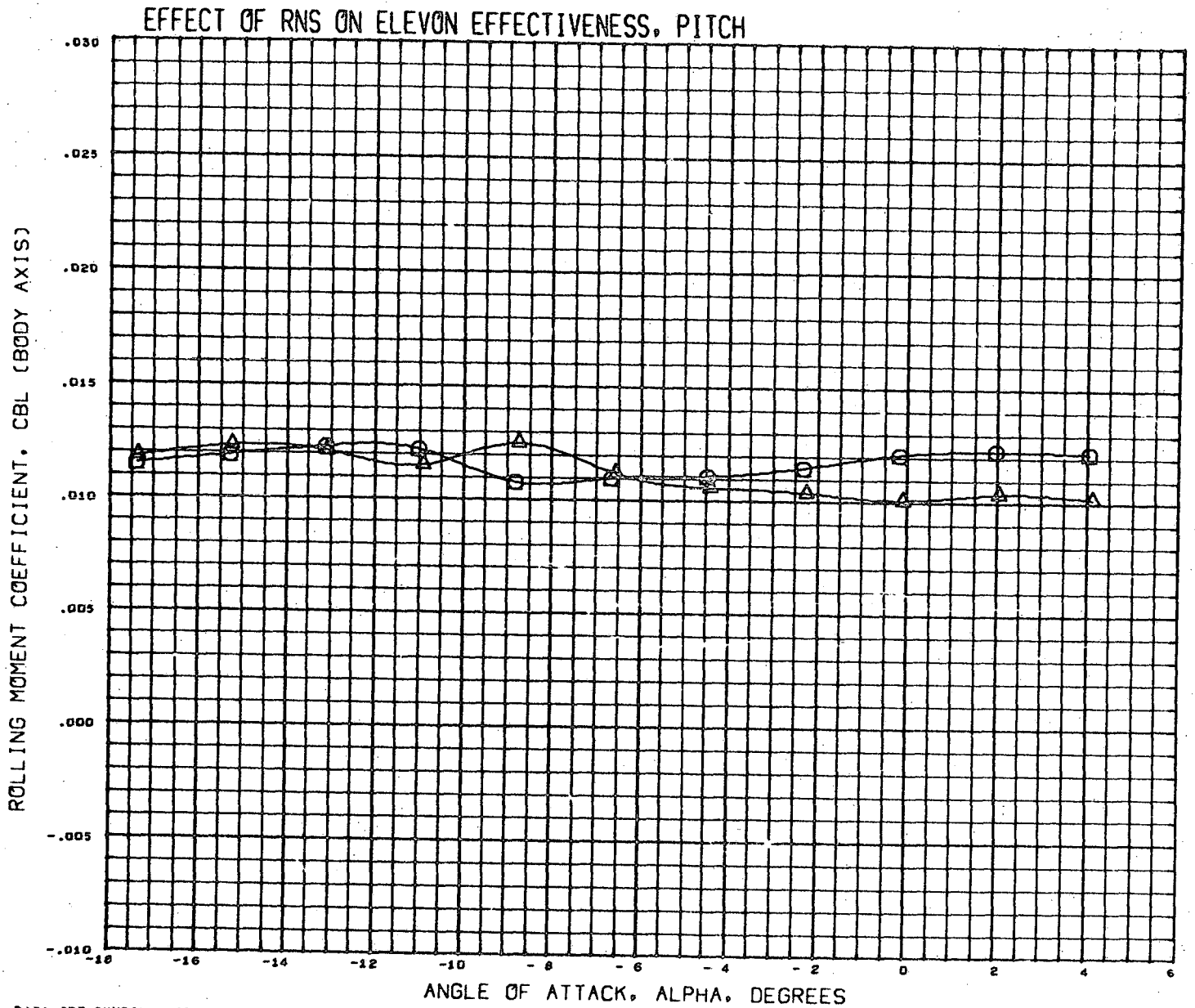


DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(A39D5A)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A39D8A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

BETA	ELVATR	AILRON	GRIT
0.000	0.000	10.000	54.000
0.000	0.000	10.000	54.000

MACH 1.189

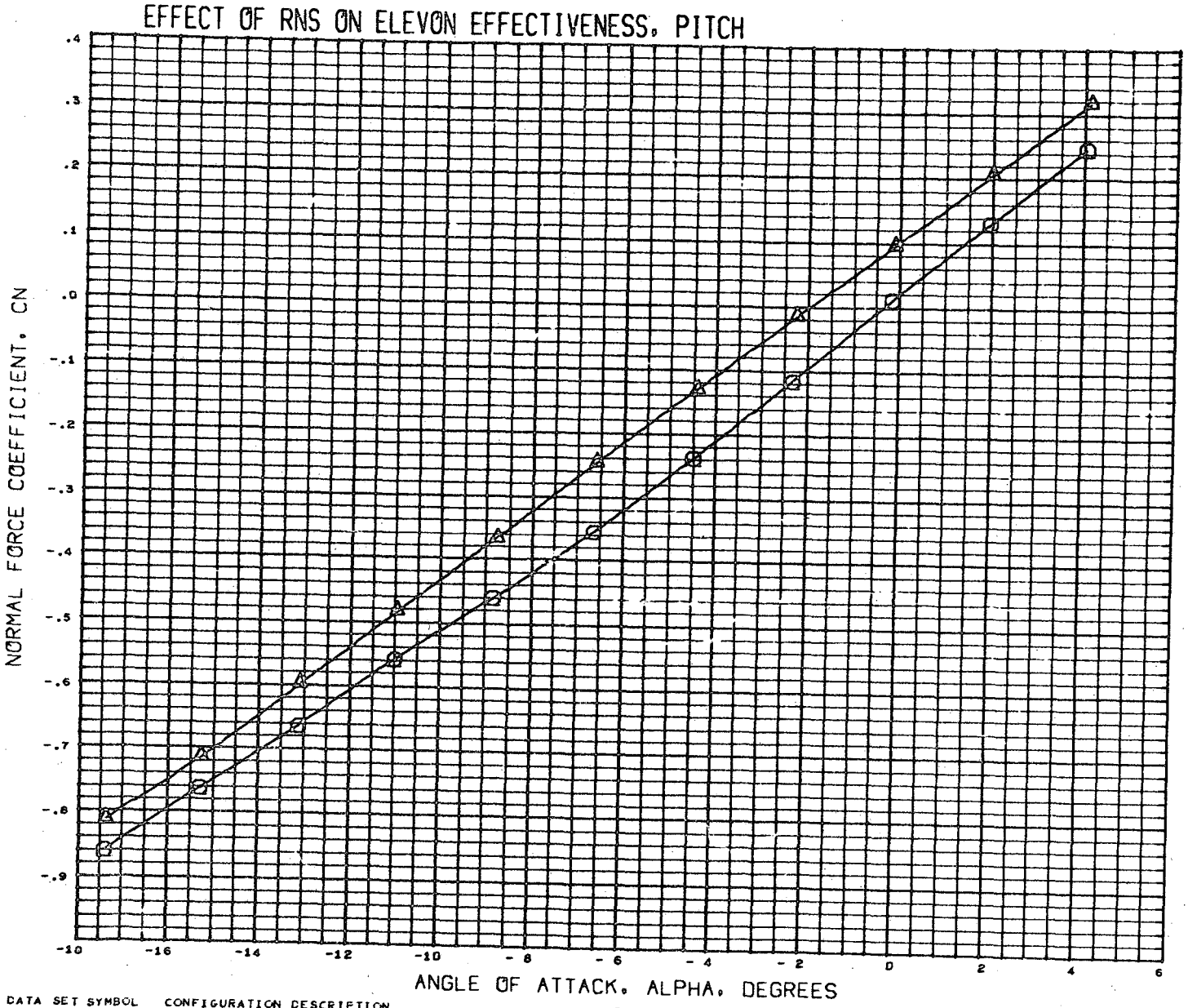
REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVATR	AILRON	GRIT
(A3905A)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	0.000	0.000	10.000	54.000
(A3908A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	0.000	10.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.189



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(A3906A)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3909A)		MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

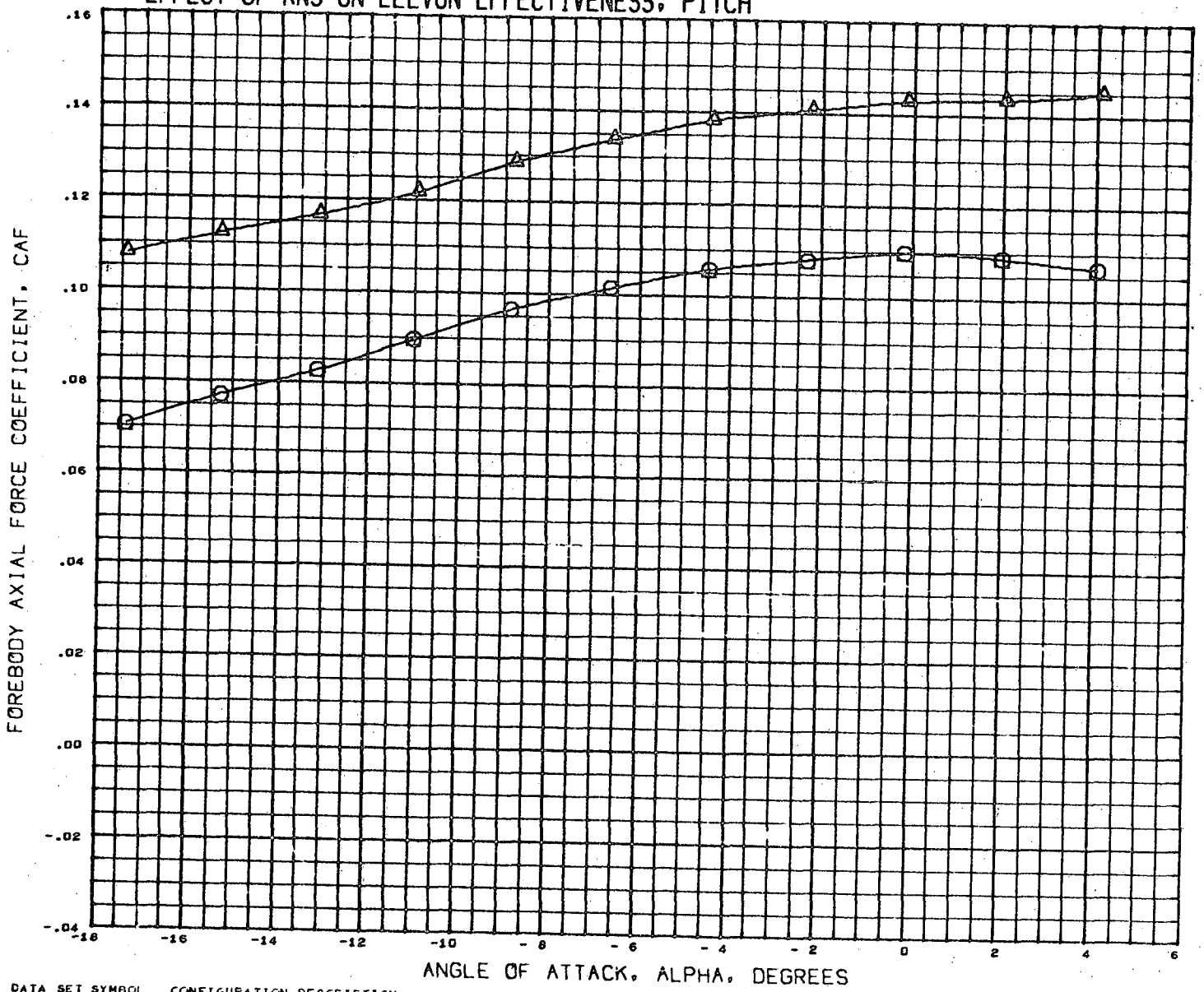
BETA	ELVATR	AILRON	GRIT
0.000	-5.000	15.000	54.000
0.000	-5.000	15.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.190

EFFECT OF RNS ON ELEVON EFFECTIVENESS, PITCH

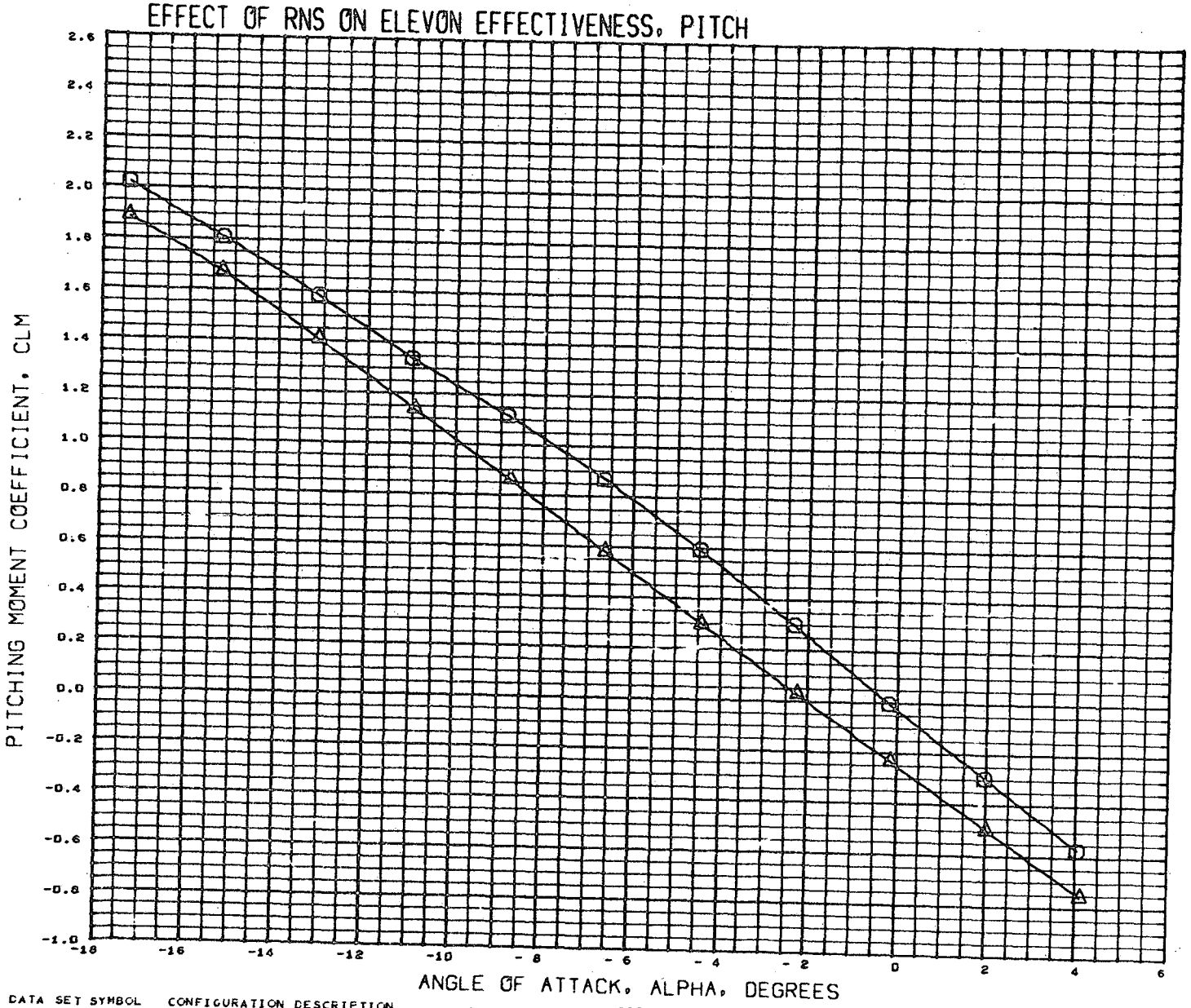


DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(A3906A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3909A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

BETA	ELVATR	AILRON	GRIT
0.000	-5.000	15.000	54.000
0.000	-5.000	15.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.190



DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(A3906A)	○	MSFC497 GC DELTA WING BOOSTER B19W14C4AV7
(A3909A)	△	MSFC497 NR/GC RNS LAUNCH B19W14C4AV7 + RNS

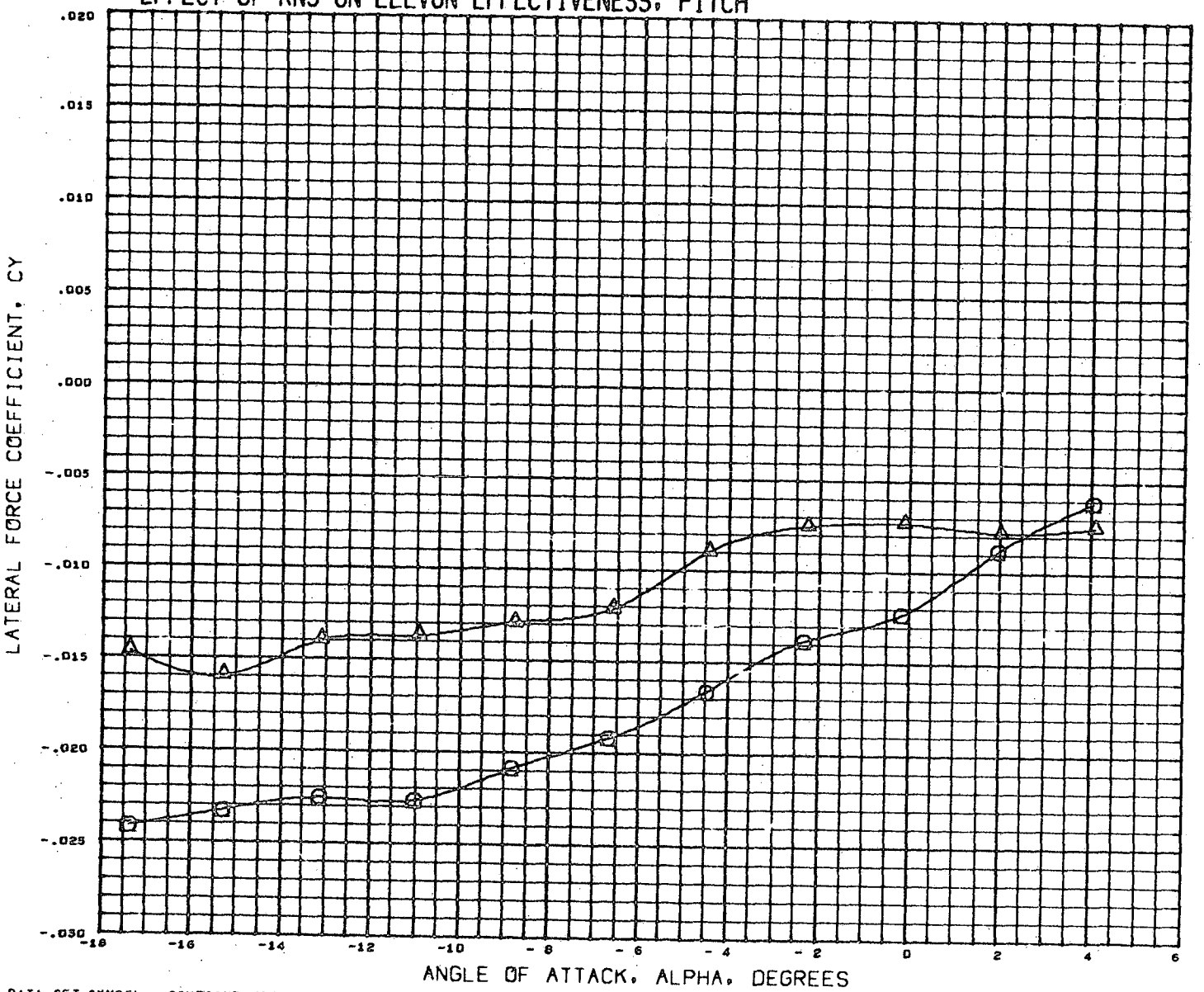
BETA	ELVATR	AILRON	GRIT
0.000	-5.000	15.000	54.000
0.000	-5.000	15.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.190

EFFECT OF RNS ON ELEVON EFFECTIVENESS, PITCH



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(A39G6A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A39D9A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

BETA	ELVATR	AILRON	GRIT
0.000	-5.000	15.000	54.000
0.000	-5.000	15.000	54.000

MACH 1.190

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
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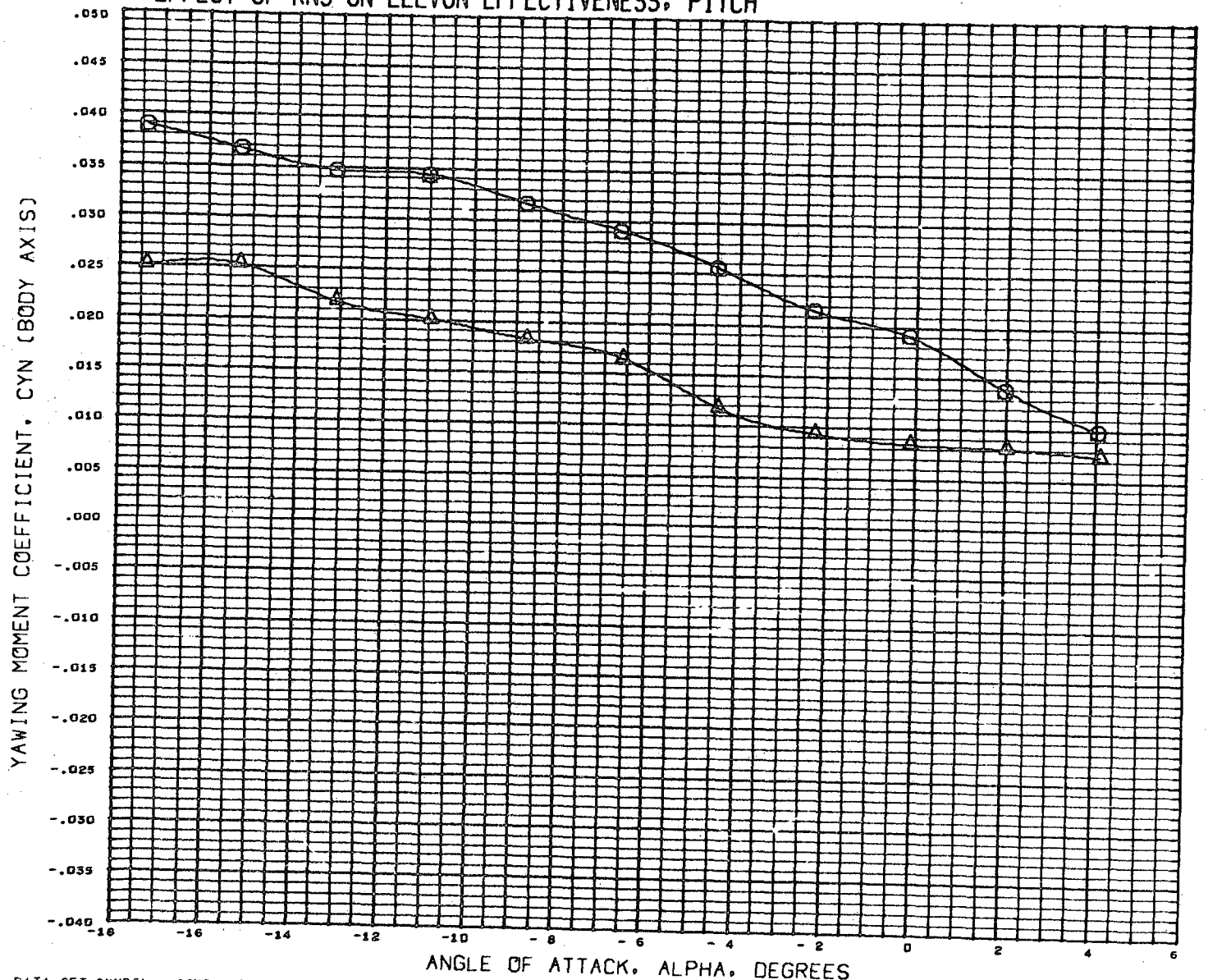
SCALE	0.0031	SCALE

EFFECT OF RNS ON ELEVON EFFECTIVENESS, PITCH



DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(A3906A)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3909A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

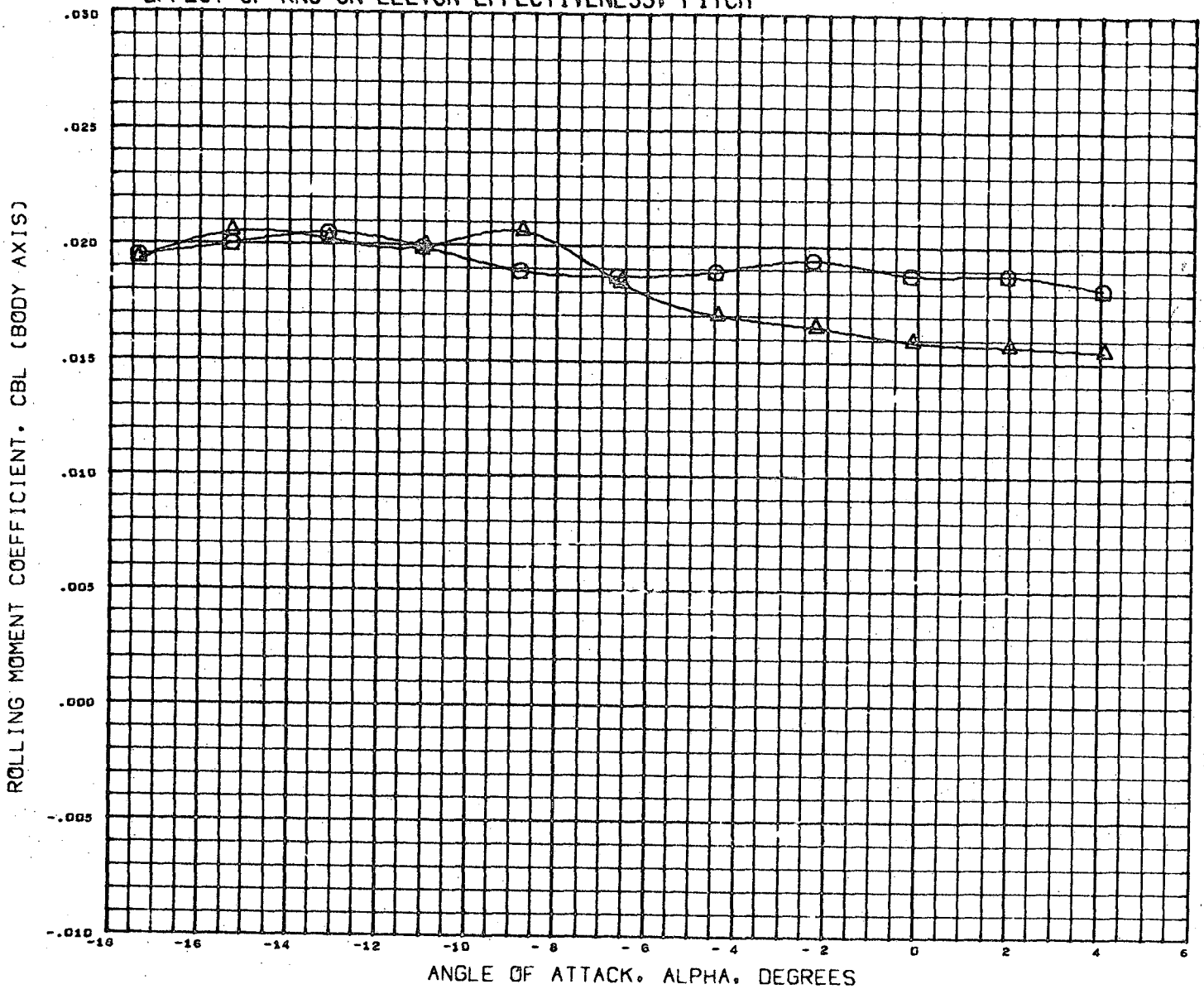
BETA	ELVATR	AILRON	GRIT
0.000	-5.000	15.000	54.000
0.000	-5.000	15.000	54.000

MACH 1.190

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF RNS ON ELEVON EFFECTIVENESS, PITCH



DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(A3906A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3909A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

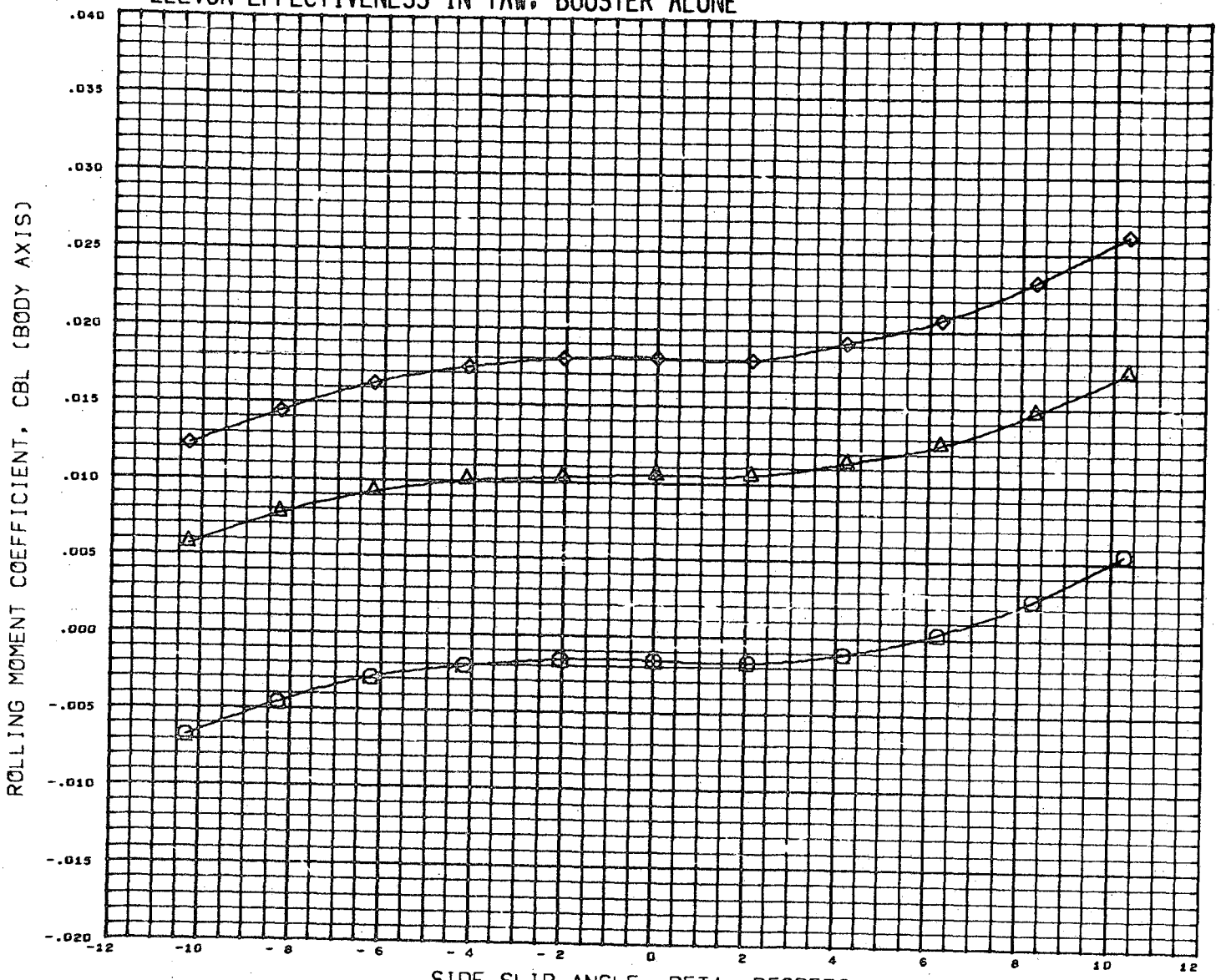
BETA	ELVATR	AILRON	GRIT
0.000	-5.000	15.000	54.000
0.000	-5.000	15.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.190

ELEVON EFFECTIVENESS IN YAW, BOOSTER ALONE



DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(D39D1B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A39D5B)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A39D6B)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

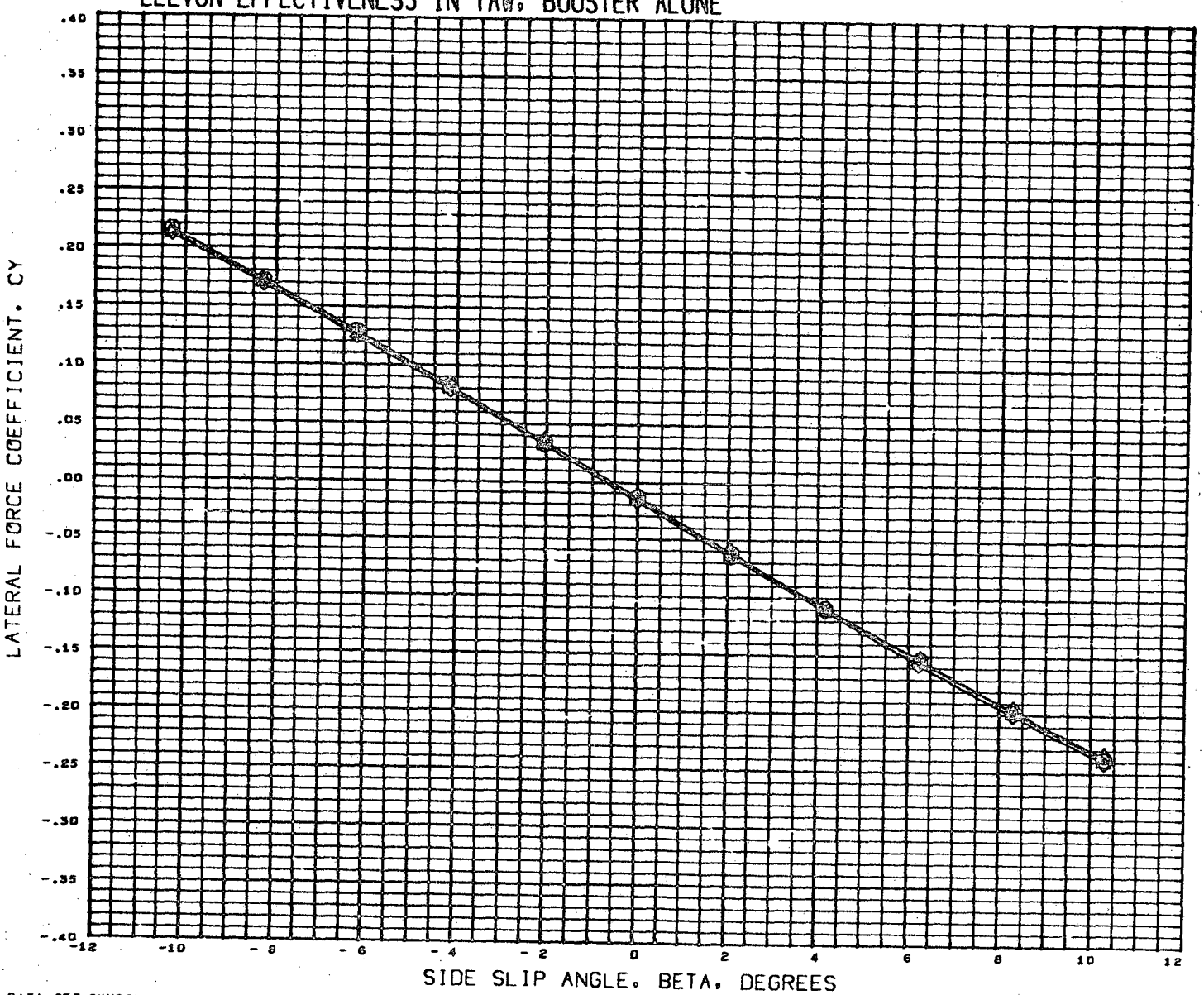
ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	0.000	
-6.000	0.000	10.000	54.000
-6.000	-5.000	15.000	54.000

MACH 1.193

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

ELEVON EFFECTIVENESS IN YAW, BOOSTER ALONE



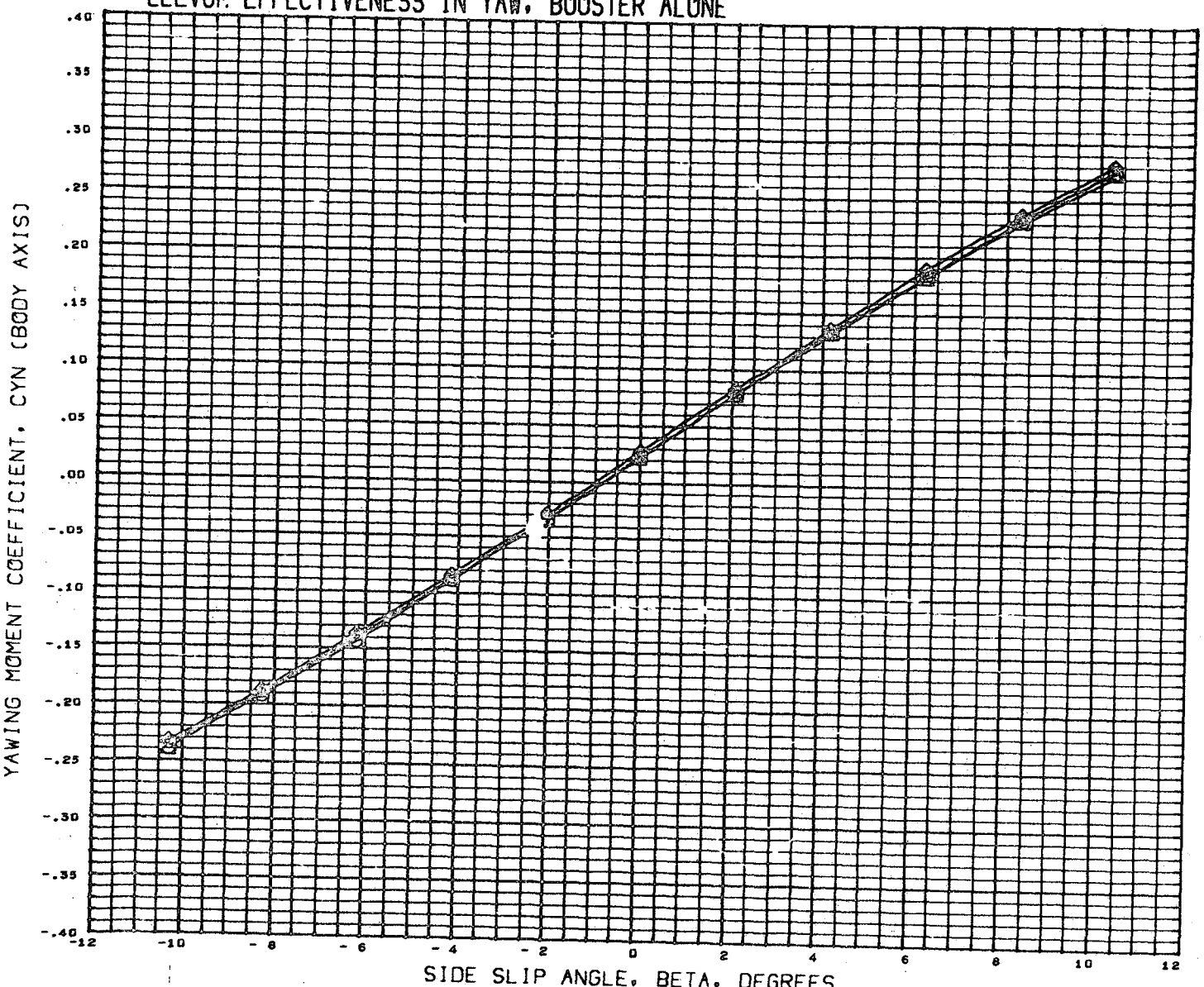
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(E3902B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3905B)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3906B)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	0.000	54.000
-6.000	0.000	10.000	54.000
-6.000	-5.000	15.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.202

ELEVON EFFECTIVENESS IN YAW, BOOSTER ALONE



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(E3902B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3905B)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3906B)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

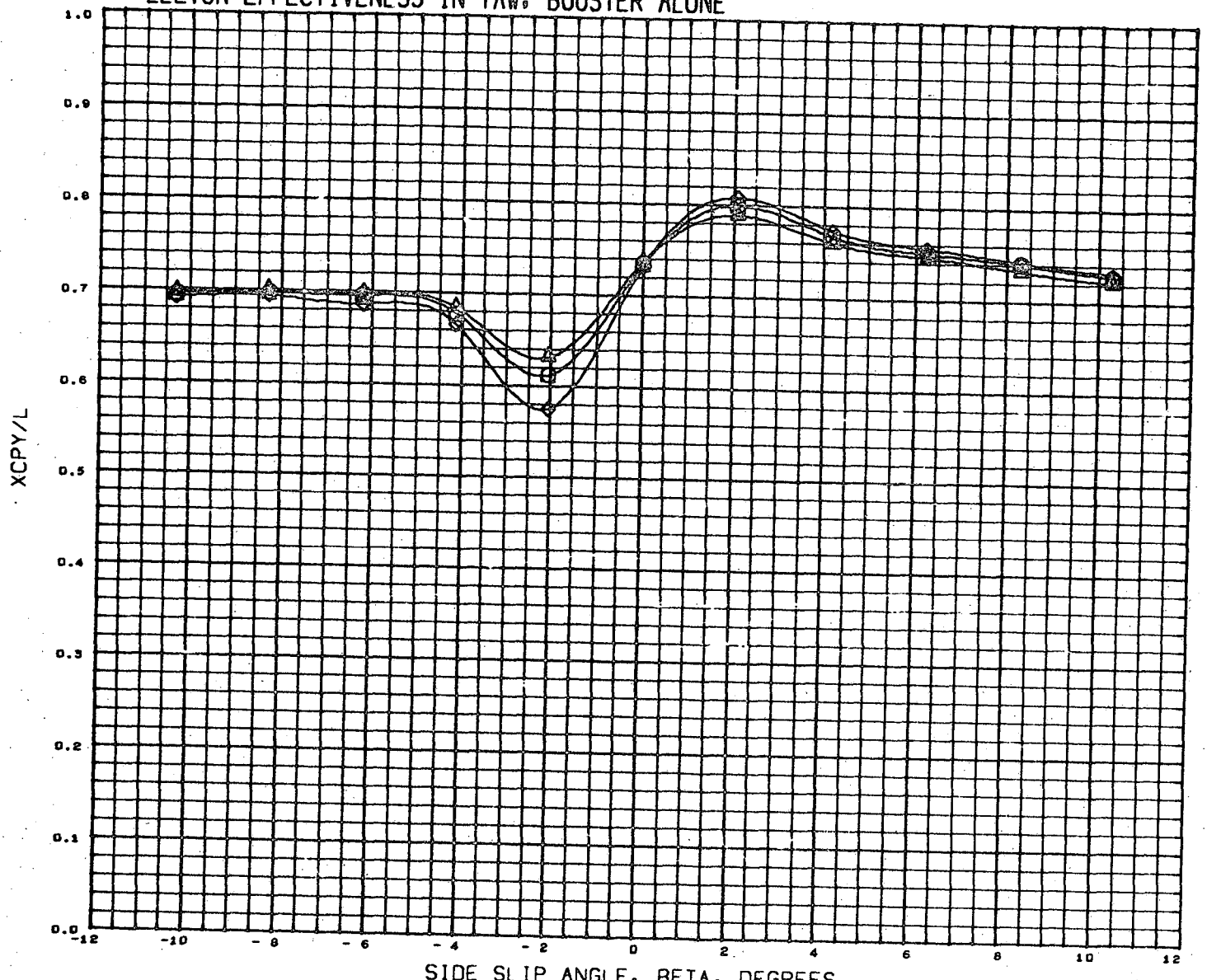
ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	0.000	54.000
-6.000	0.000	10.000	54.000
-6.000	-5.000	15.000	54.000

MACH 1.202

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

ELEVØN EFFECTIVENESS IN YAW, BOOSTER ALONE



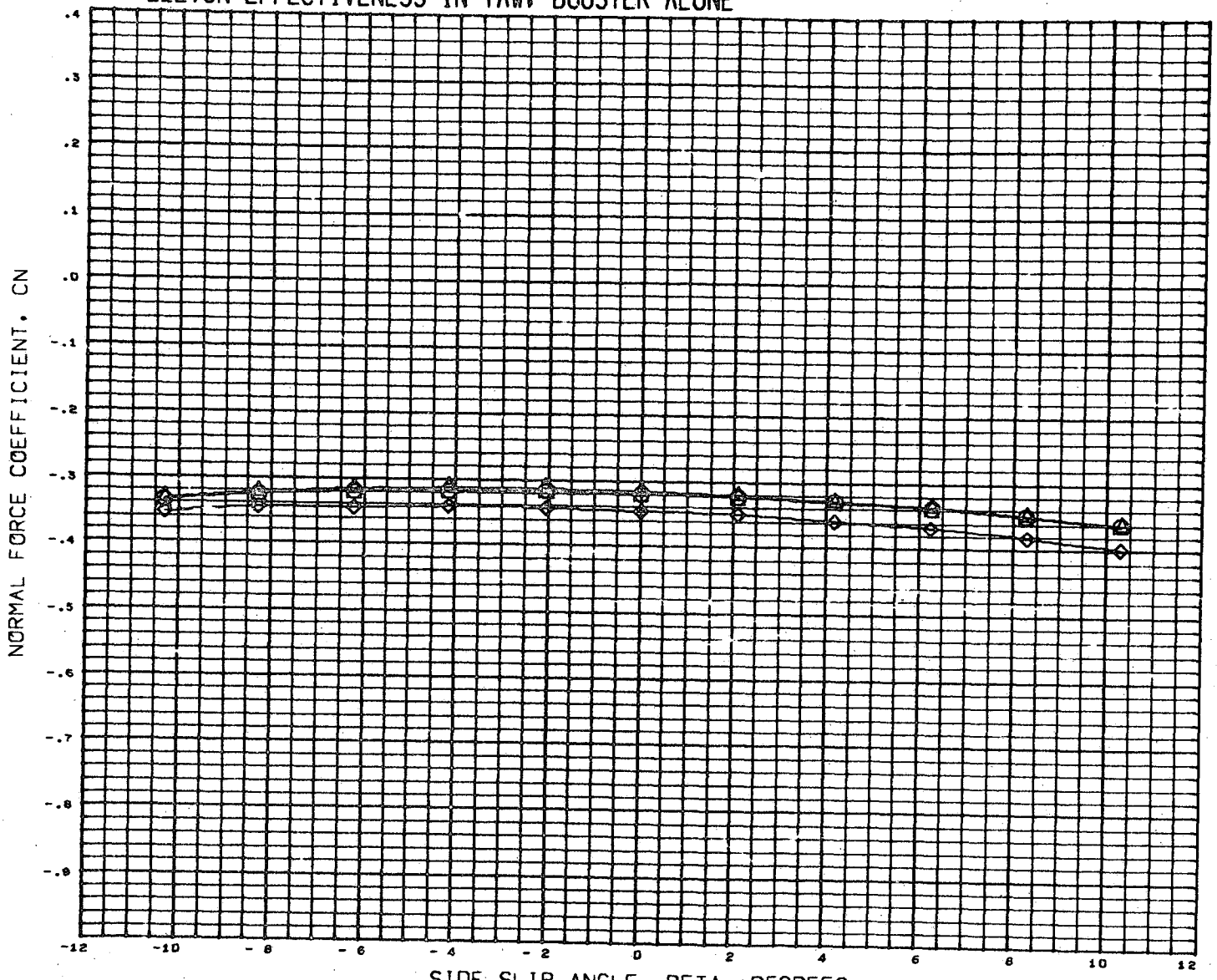
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(E3902B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3905B)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3906B)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	0.000	54.000
-6.000	0.000	10.000	54.000
-6.000	-5.000	15.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.202

ELEVON EFFECTIVENESS IN YAW, BOOSTER ALONE



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(E3902B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3905B)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3906B)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

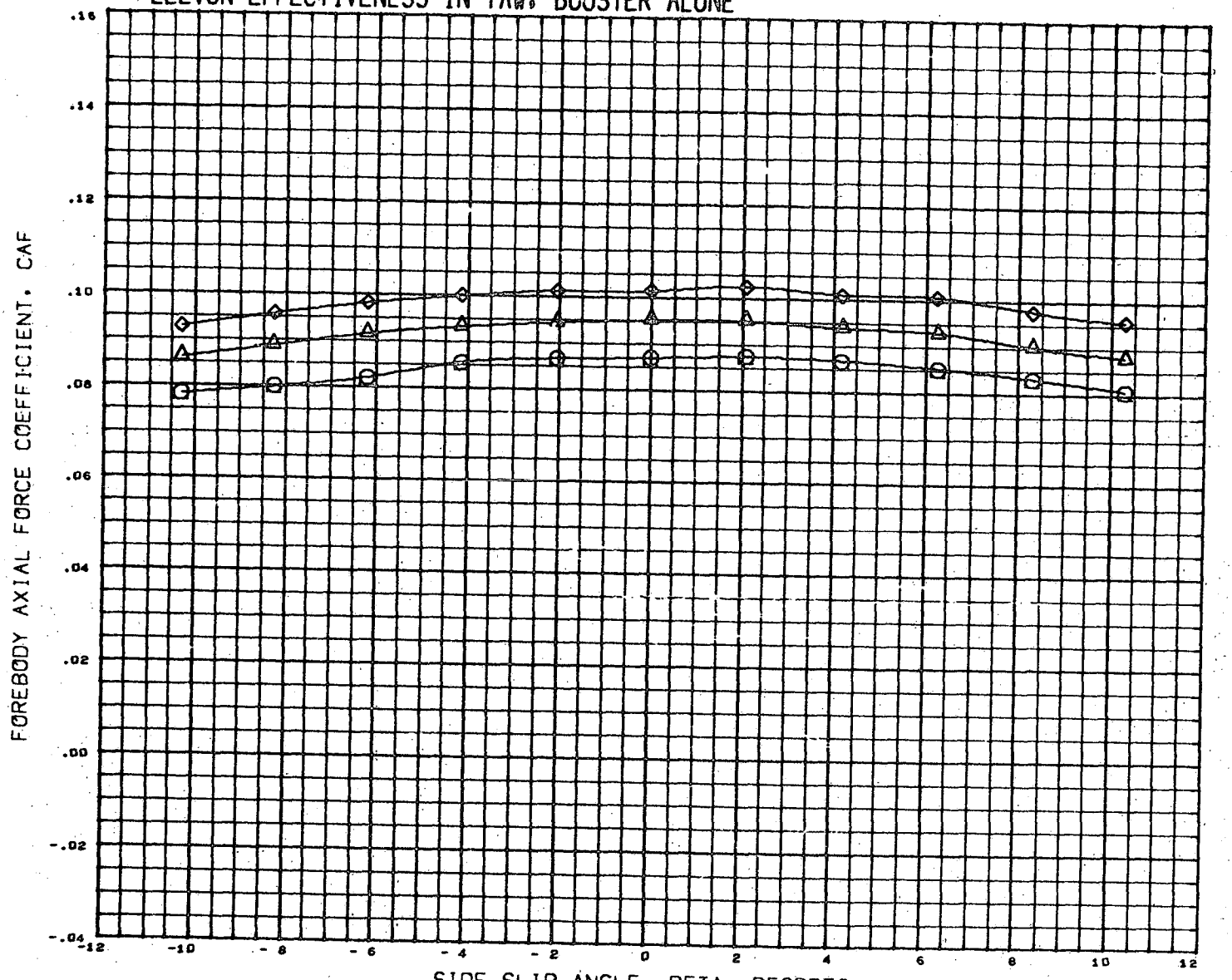
ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	0.000	54.000
-6.000	0.000	10.000	54.000
-6.000	-5.000	15.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.202

ELEVON EFFECTIVENESS IN YAW, BOOSTER ALONE



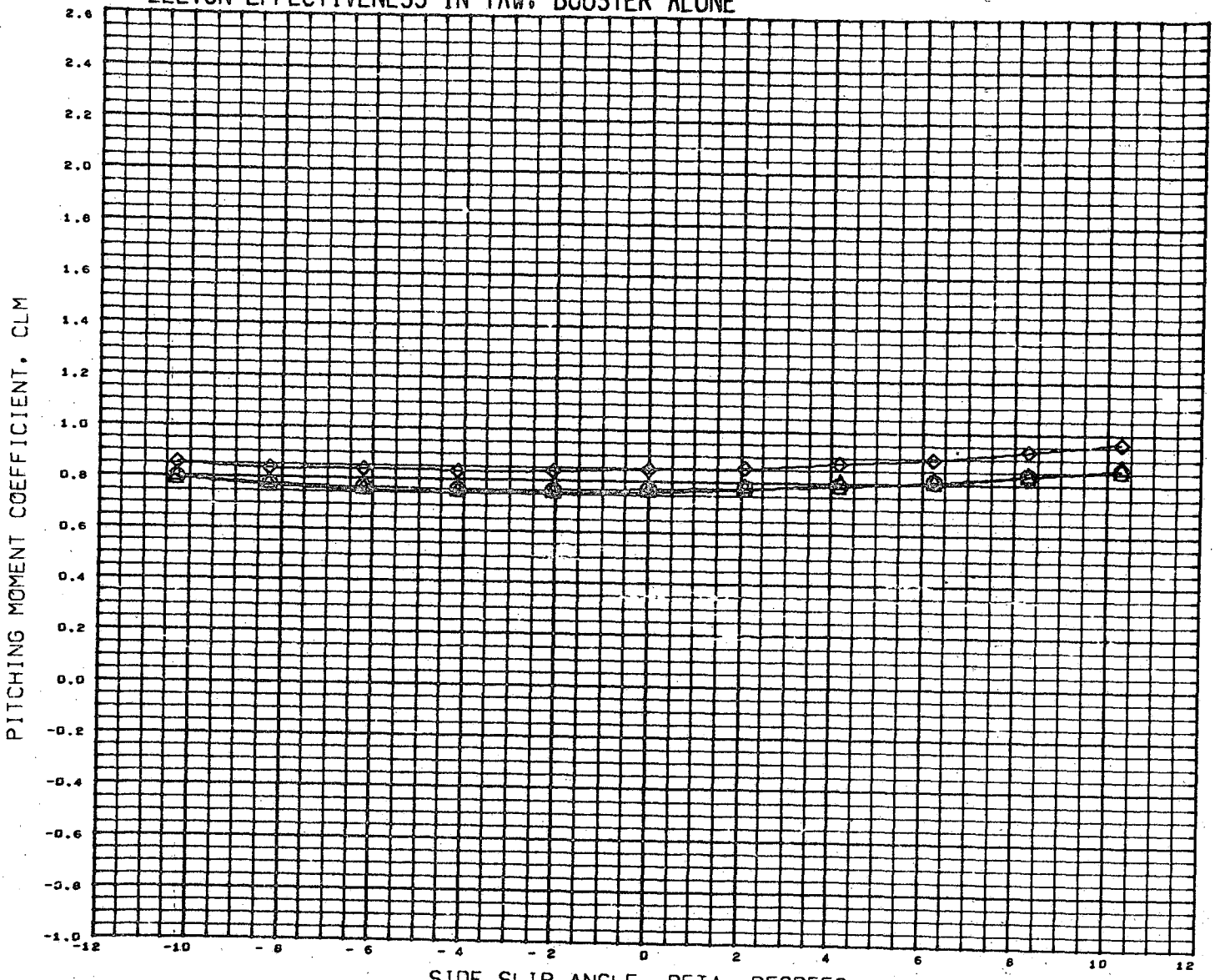
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(E3902B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3905B)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3906B)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	0.000	54.000
-6.000	0.000	10.000	54.000
-6.000	-5.000	15.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.202

ELEVON EFFECTIVENESS IN YAW, BOOSTER ALONE



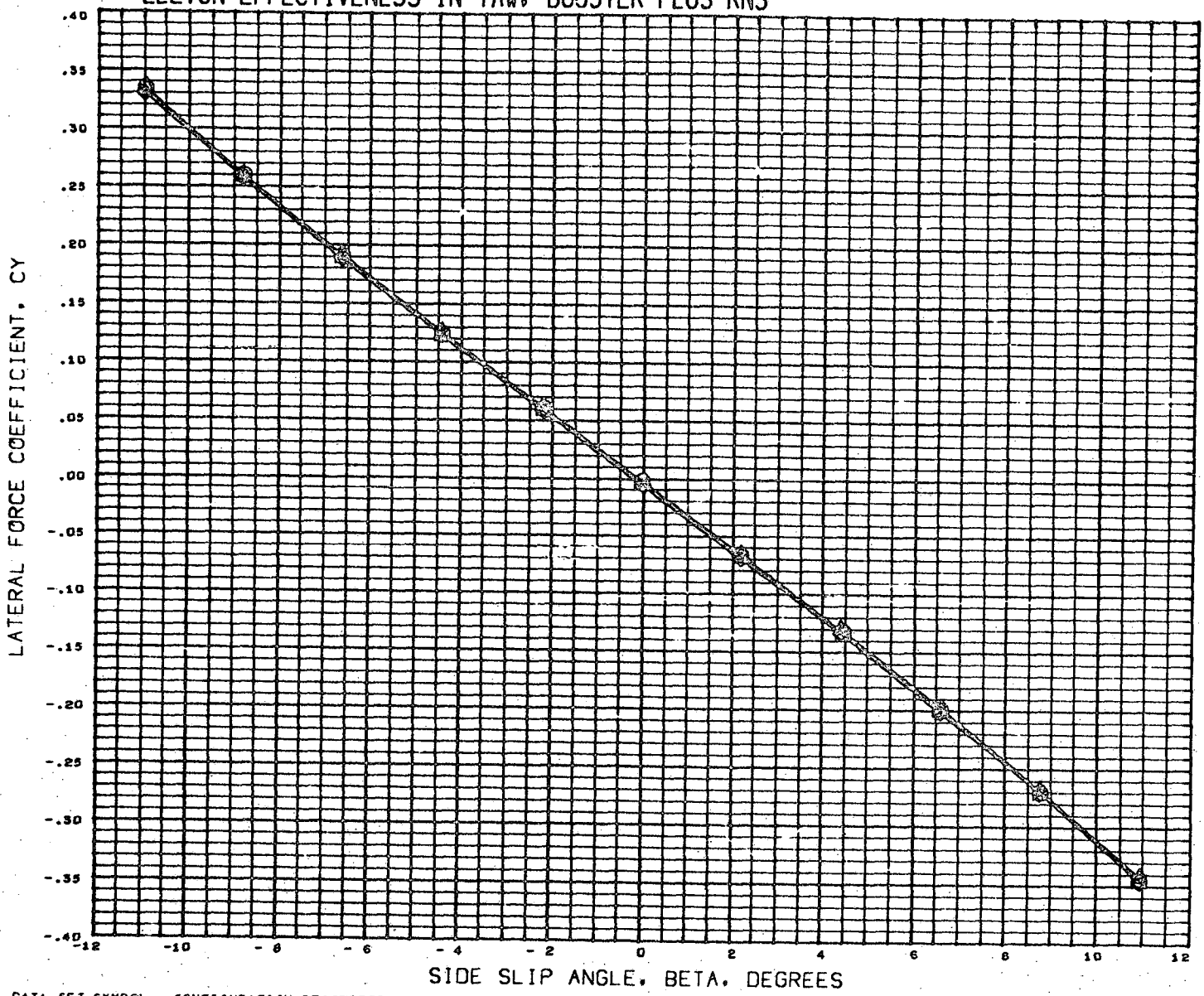
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(E3902B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3905B)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3906B)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	0.000	54.000
-6.000	0.000	10.000	54.000
-6.000	-5.000	15.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.202

ELEVON EFFECTIVENESS IN YAW, BOOSTER PLUS RNS



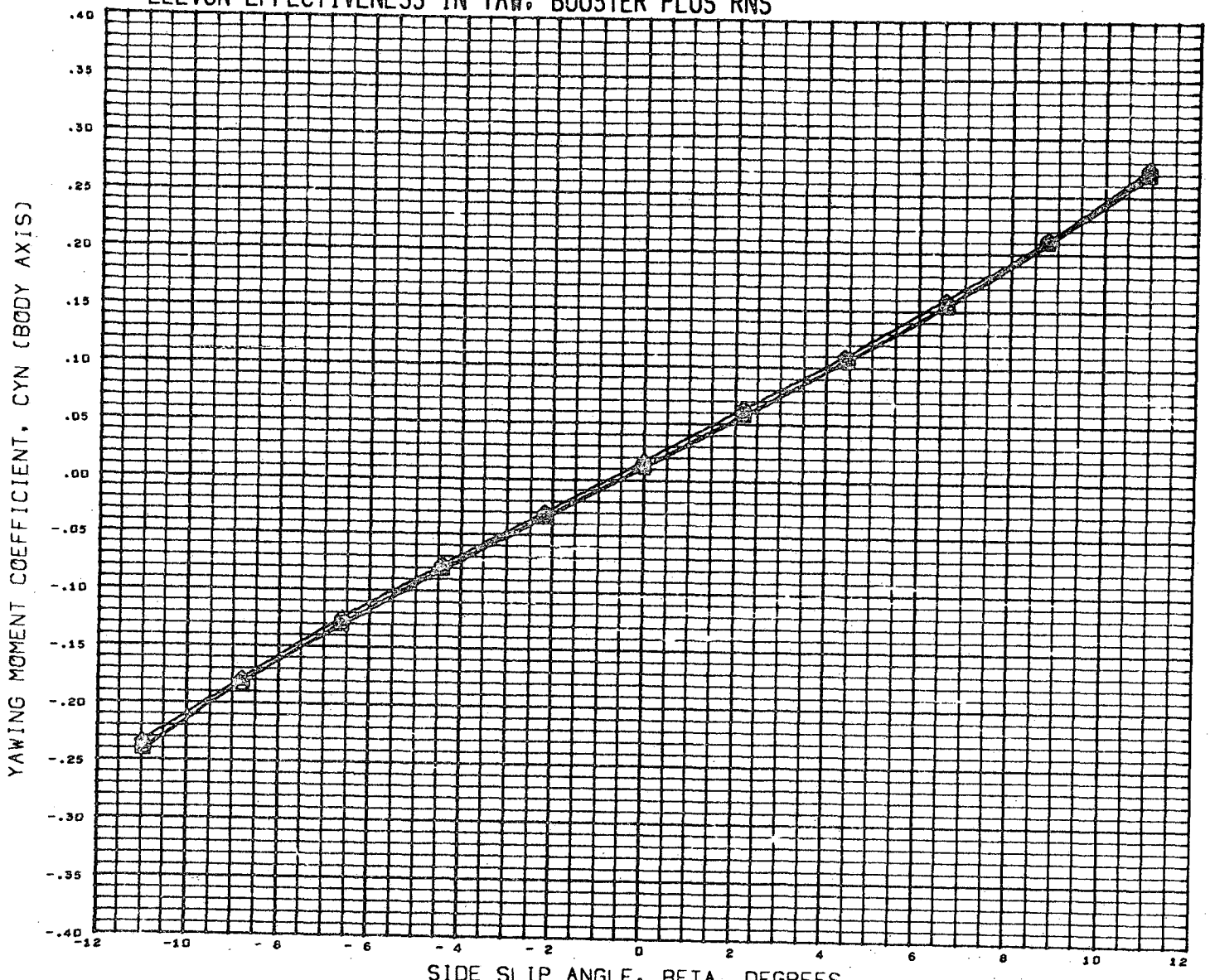
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(D3907B)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3908B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3909B)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	0.000	54.000
-6.000	0.000	10.000	54.000
-6.000	-5.000	15.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.199

ELEVON EFFECTIVENESS IN YAW, BOOSTER PLUS RNS



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3907B)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3908B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3909B)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

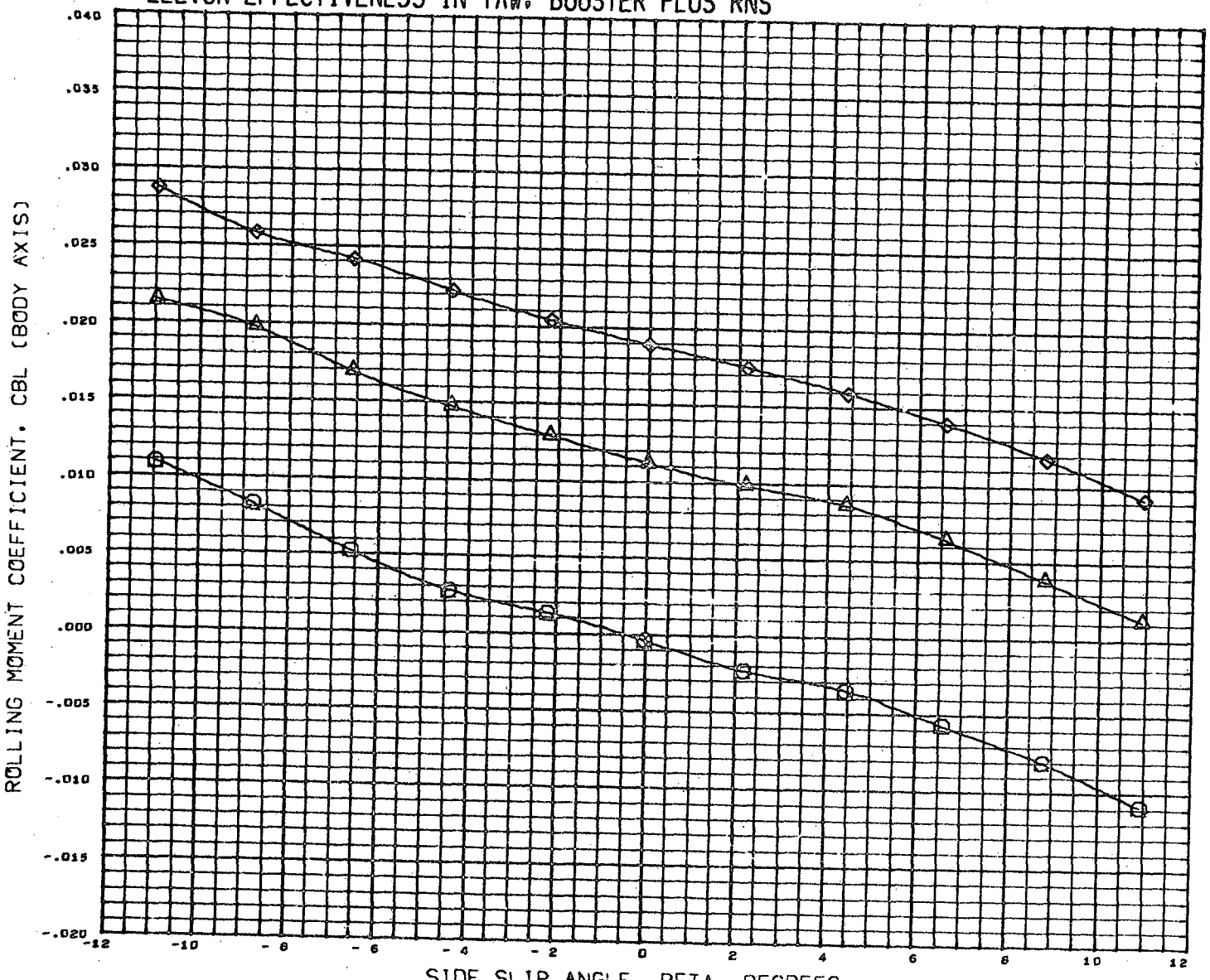
ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	0.000	54.000
-6.000	0.000	10.000	54.000
-6.000	-5.000	15.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.199

ELEVON EFFECTIVENESS IN YAW, BOOSTER PLUS RNS



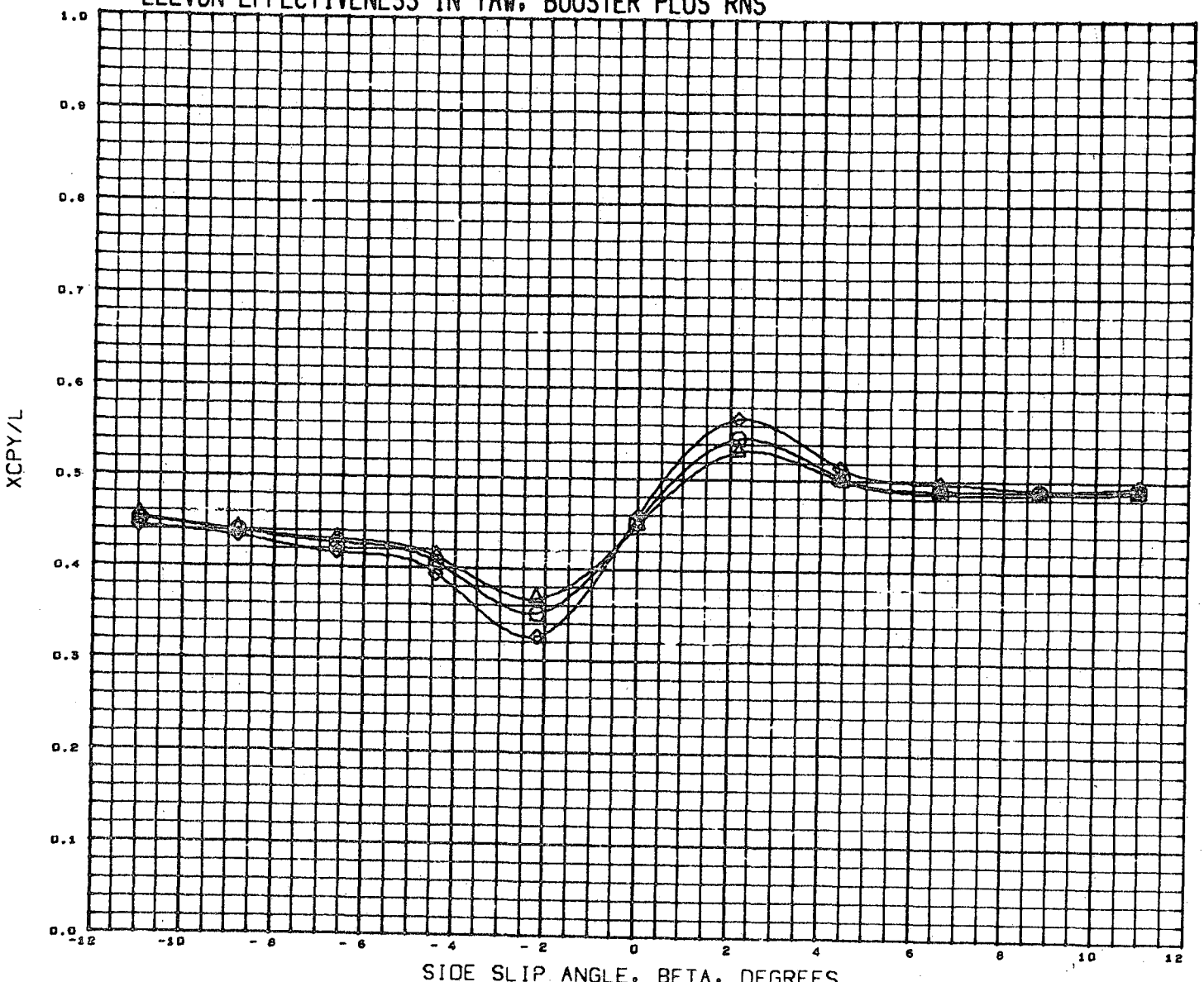
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(D3907B) ○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3908B) △	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3909B) ◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	0.000	54.000
-6.000	0.000	10.000	54.000
-6.000	-5.000	15.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.199

ELEVON EFFECTIVENESS IN YAW, BOOSTER PLUS RNS



DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(C3907B) ○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3908B) △	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3909B) ◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

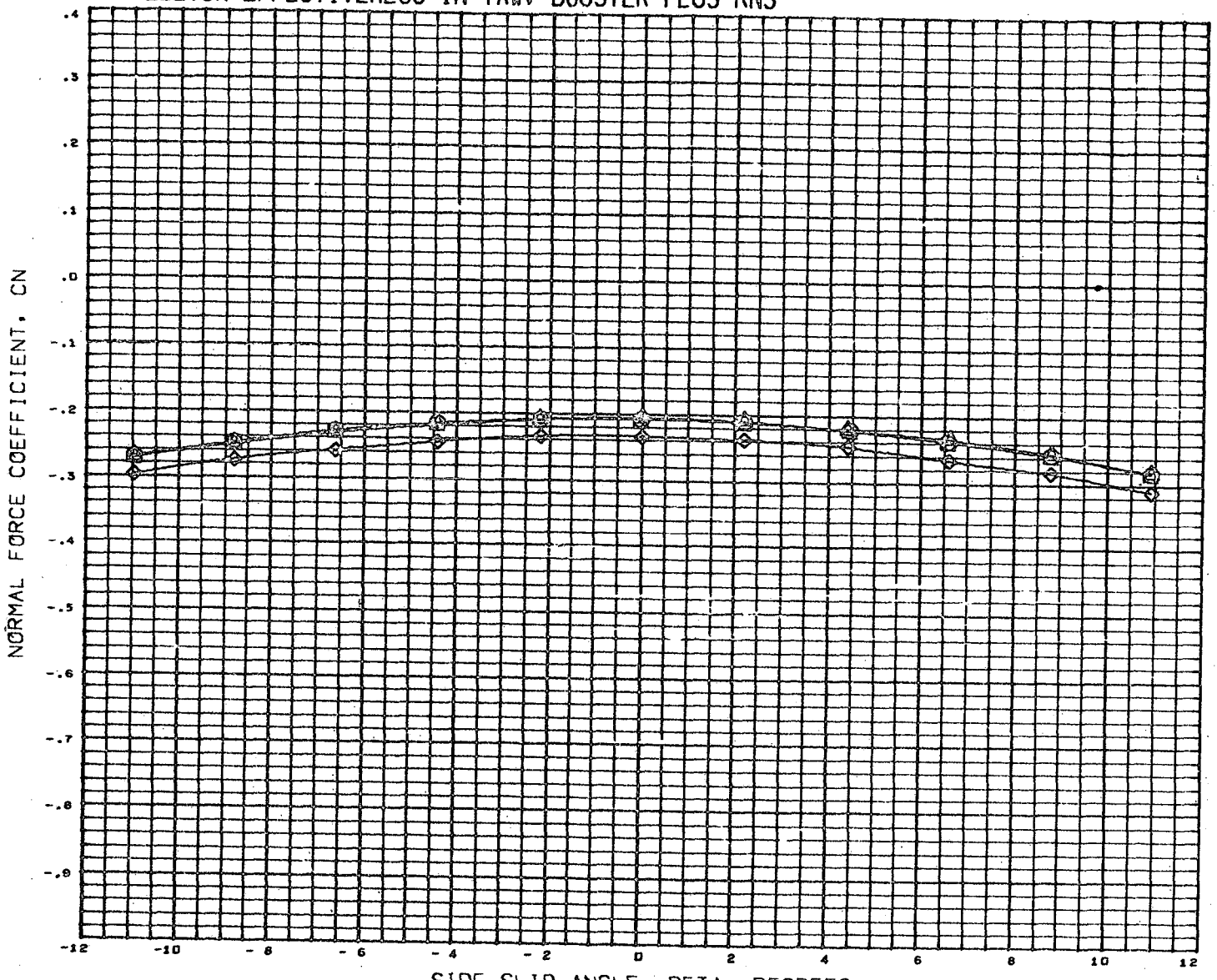
ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	0.000	54.000
-6.000	0.000	10.000	54.000
-6.000	-5.000	15.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.199

ELEVON EFFECTIVENESS IN YAW, BOOSTER PLUS RNS



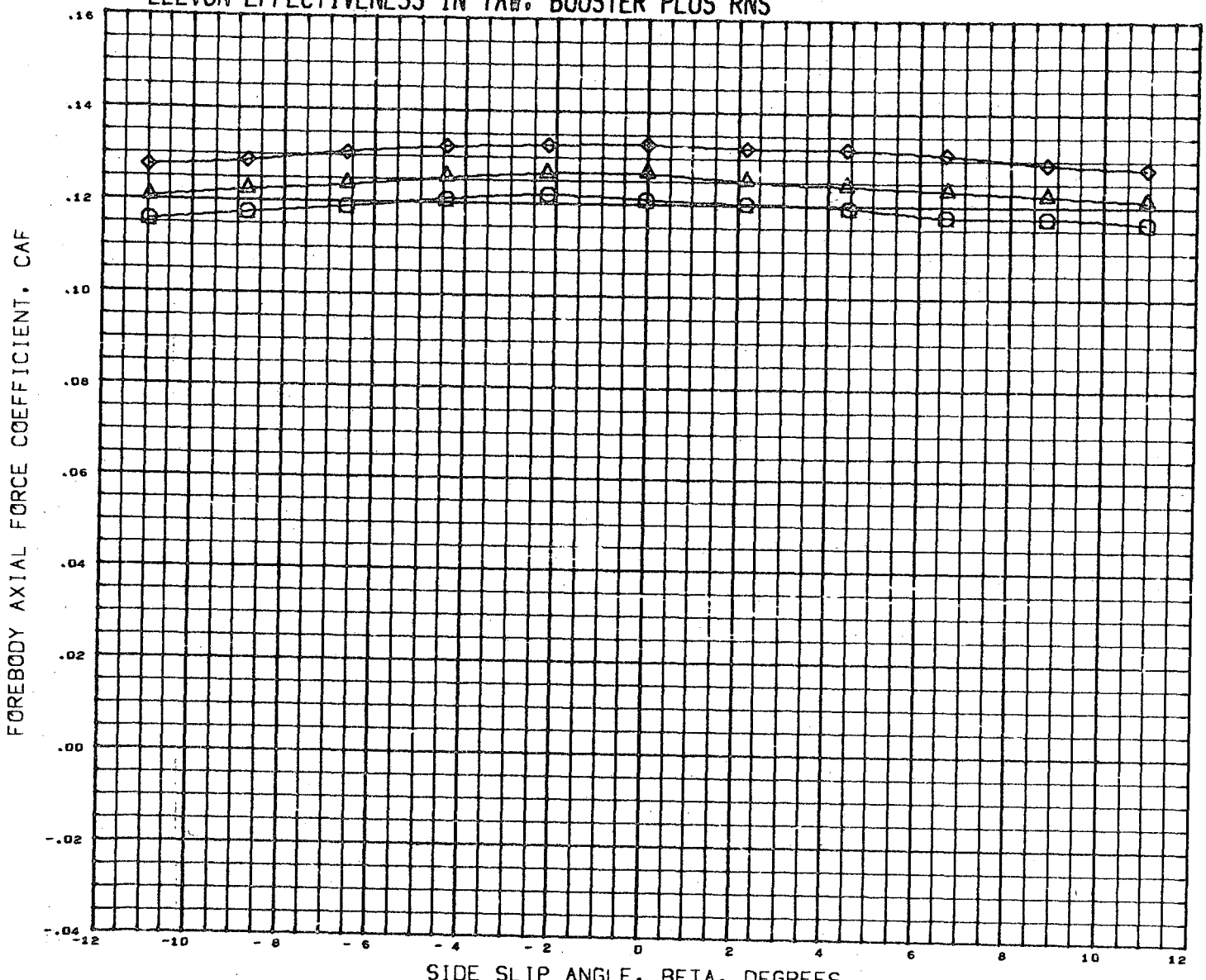
DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(D3907B)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3908B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3909B)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	0.000	54.000
-6.000	0.000	10.000	54.000
-6.000	-5.000	15.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.199

ELEVON EFFECTIVENESS IN YAW, BOOSTER PLUS RNS



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(D3907B)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3908B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3909B)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

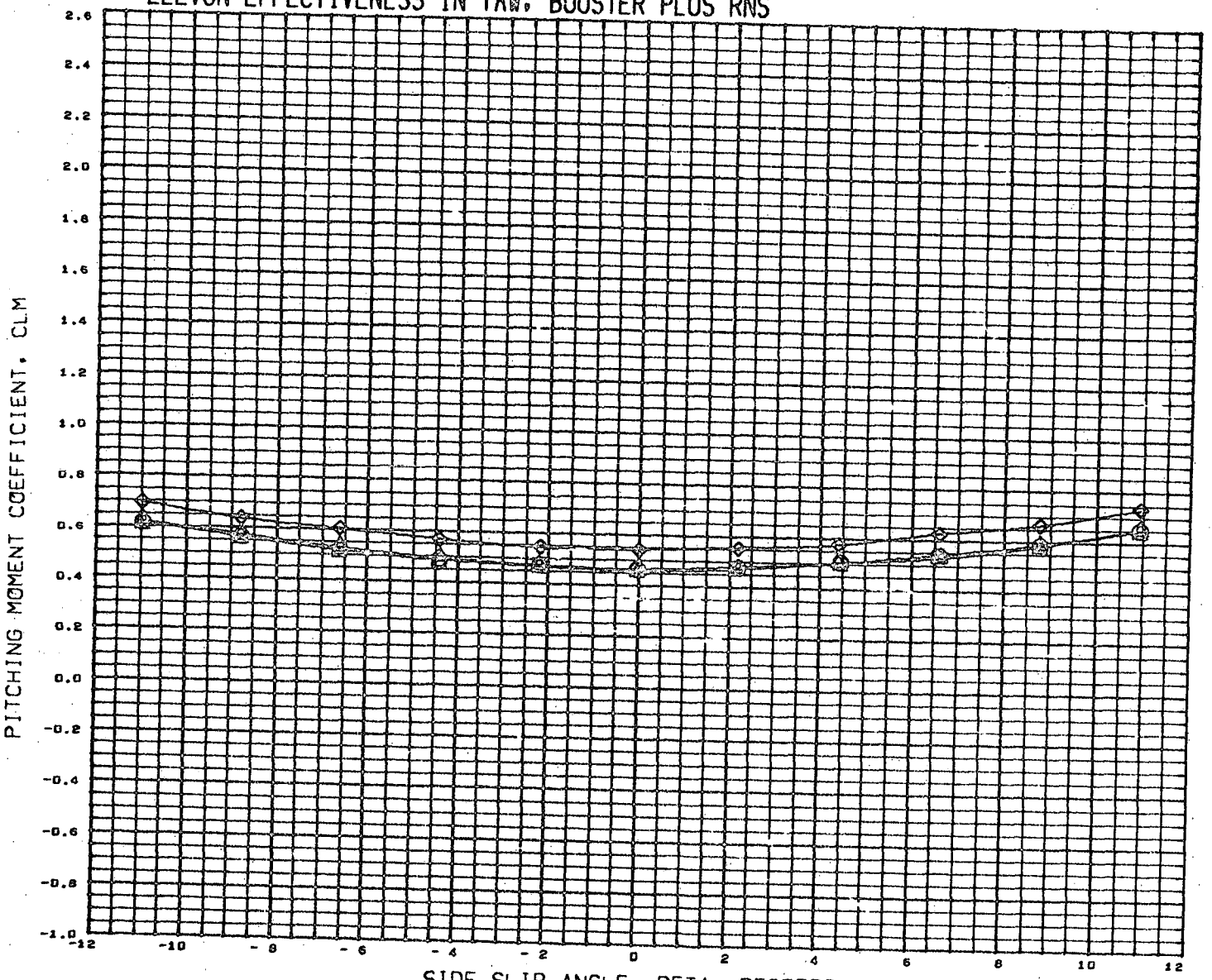
ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	0.000	54.000
-6.000	0.000	10.000	54.000
-6.000	-5.000	15.000	54.000

MACH : 1.199

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

3

ELEVON EFFECTIVENESS IN YAW, BOOSTER PLUS RNS



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(D3907B)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3908B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3909B)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

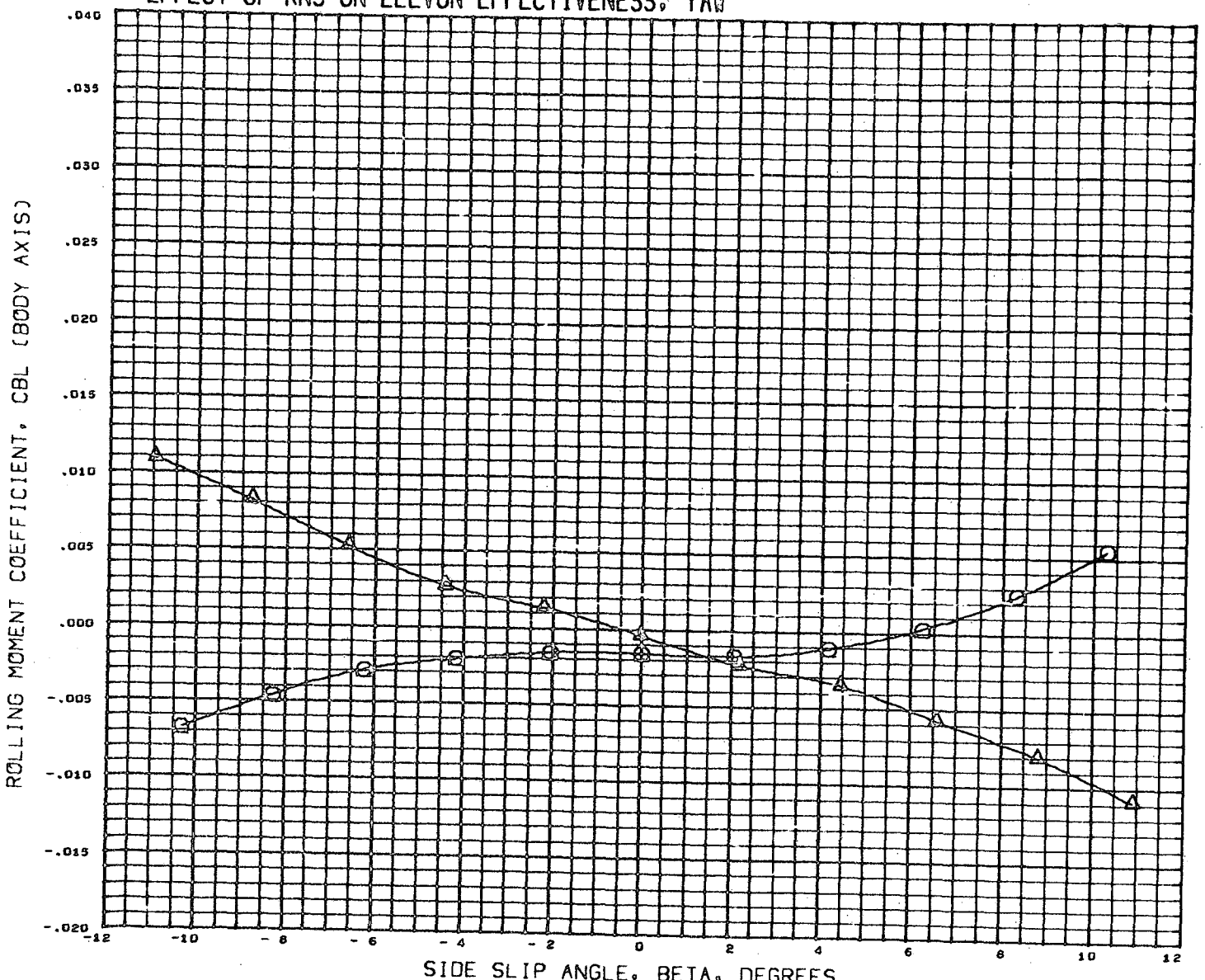
ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	0.000	54.000
-6.000	0.000	10.000	54.000
-6.000	-5.000	15.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.199

EFFECT OF RNS ON ELEVON EFFECTIVENESS, YAW



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(D3901B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(D3907B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

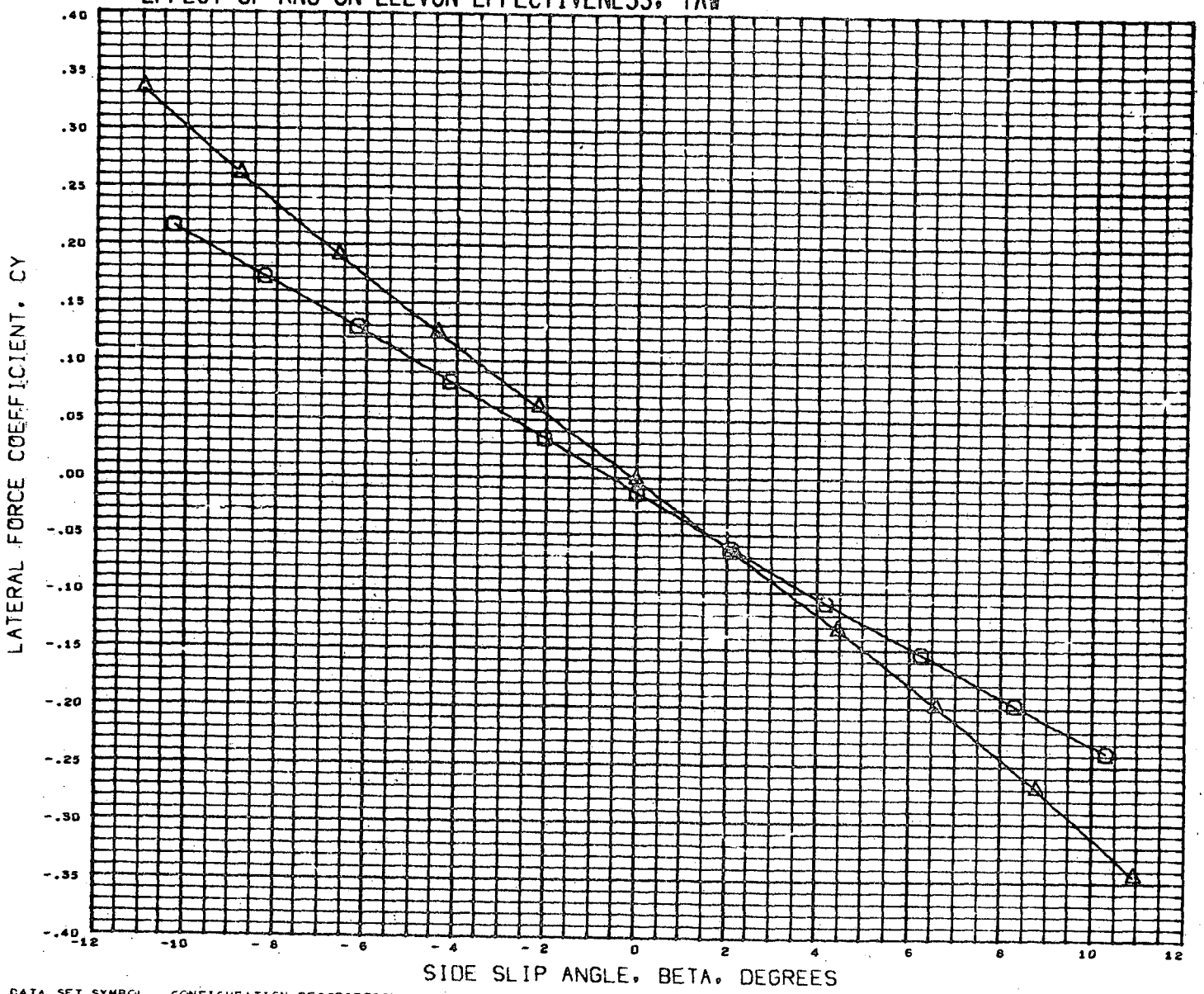
ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	0.000	
-6.000	0.000	0.000	54.000

MACH 1.193

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF RNS ON ELEVON EFFECTIVENESS, YAW



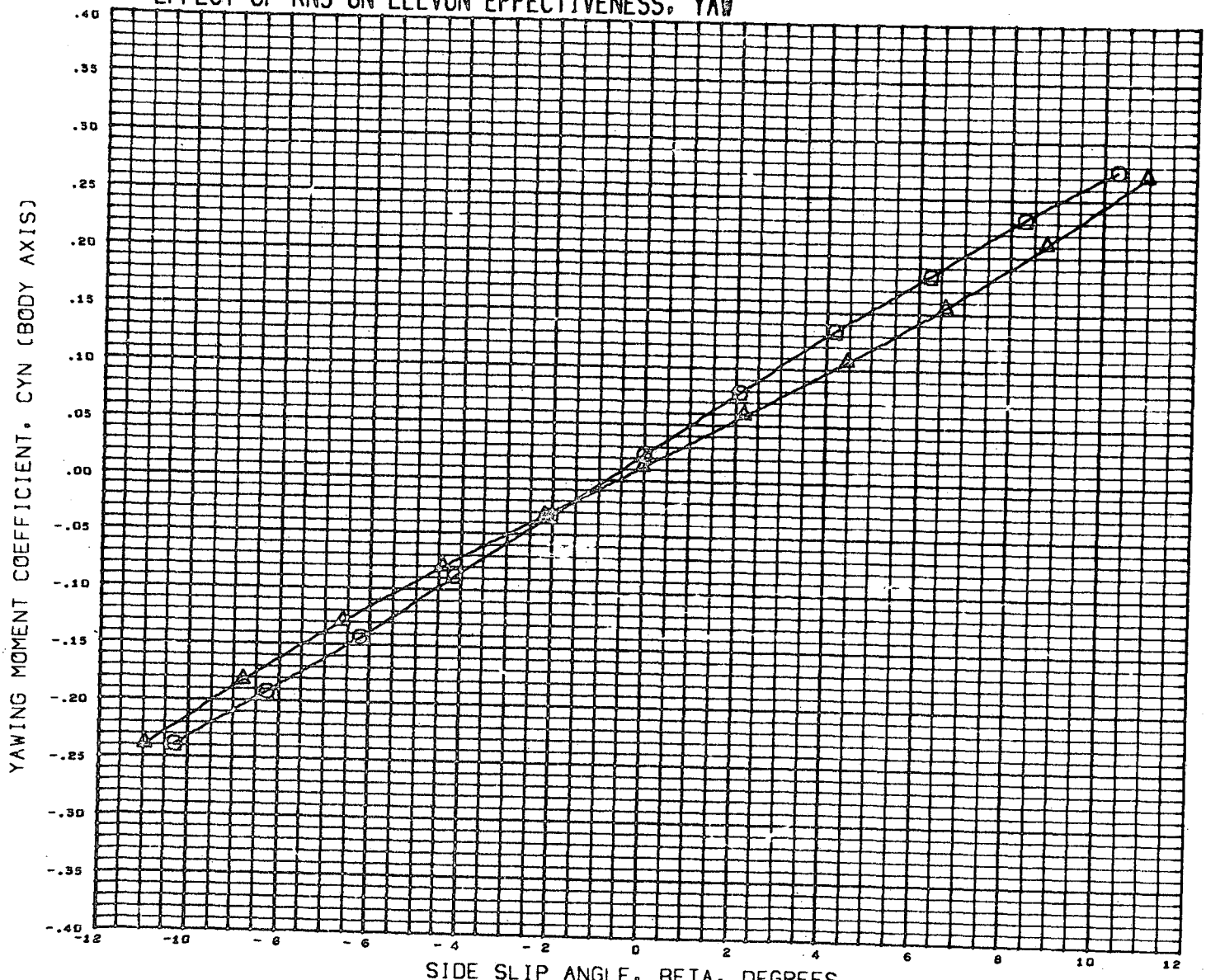
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(E3902B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(D3907B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	0.000	54.000
-6.000	0.000	0.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRF	0.0000	
YMRF	0.0000	
ZMRF	0.0000	
SCALE	0.0031	SCALE

MACH 1.202

EFFECT OF RNS ON ELEVON EFFECTIVENESS, YAW



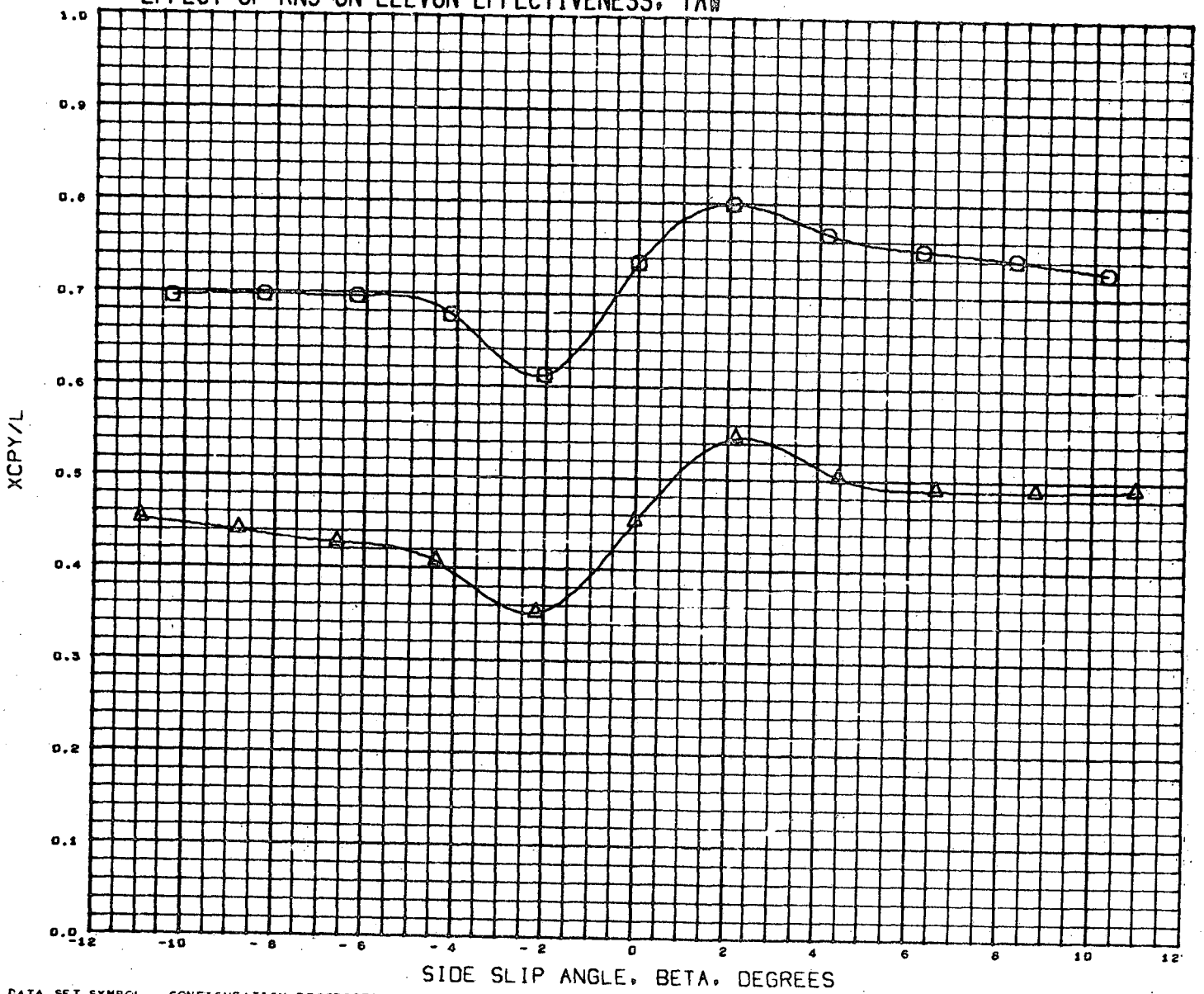
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	ELVATR	AILRON	GRIT
(E3902B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	0.000	0.000	54.000
(D3907B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	-6.000	0.000	0.000	54.000

MACH 1.202

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF RNS ON ELEVON EFFECTIVENESS, YAW



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(E3902B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(D3907B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

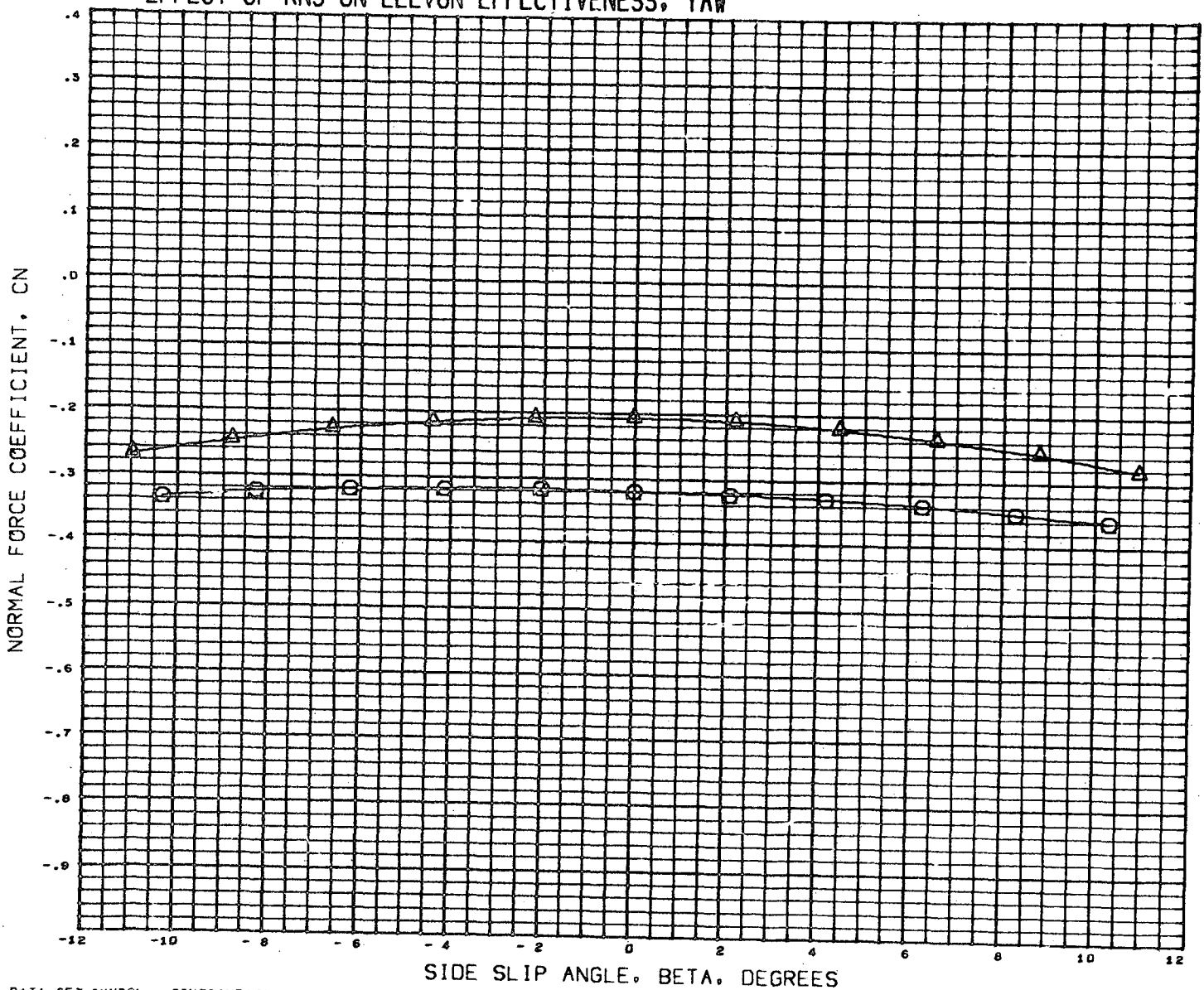
ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	0.000	54.000
-6.000	0.000	0.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.202

EFFECT OF RNS ON ELEVON EFFECTIVENESS, YAW



DATA SET SYMBOL		CONFIGURATION DESCRIPTION	ALPHA	ELVATR	AILRON	GRIT
(E3902B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	0.000	0.000	54.000
(D3907B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	-6.000	0.000	0.000	54.000

MACH 1.202

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
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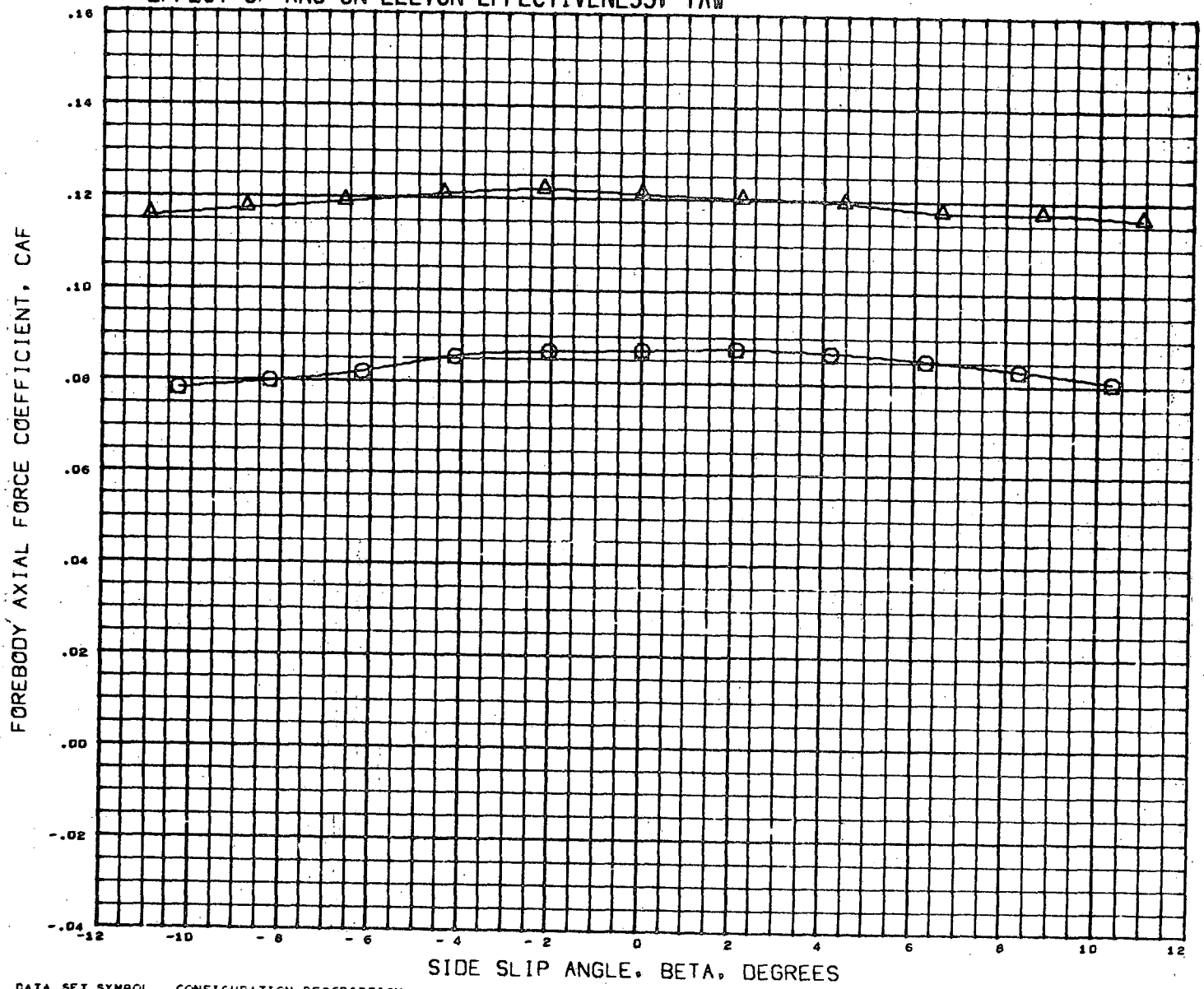
SCALE	0.0031	SCALE

EFFECT OF RNS ON ELEVON EFFECTIVENESS, YAW



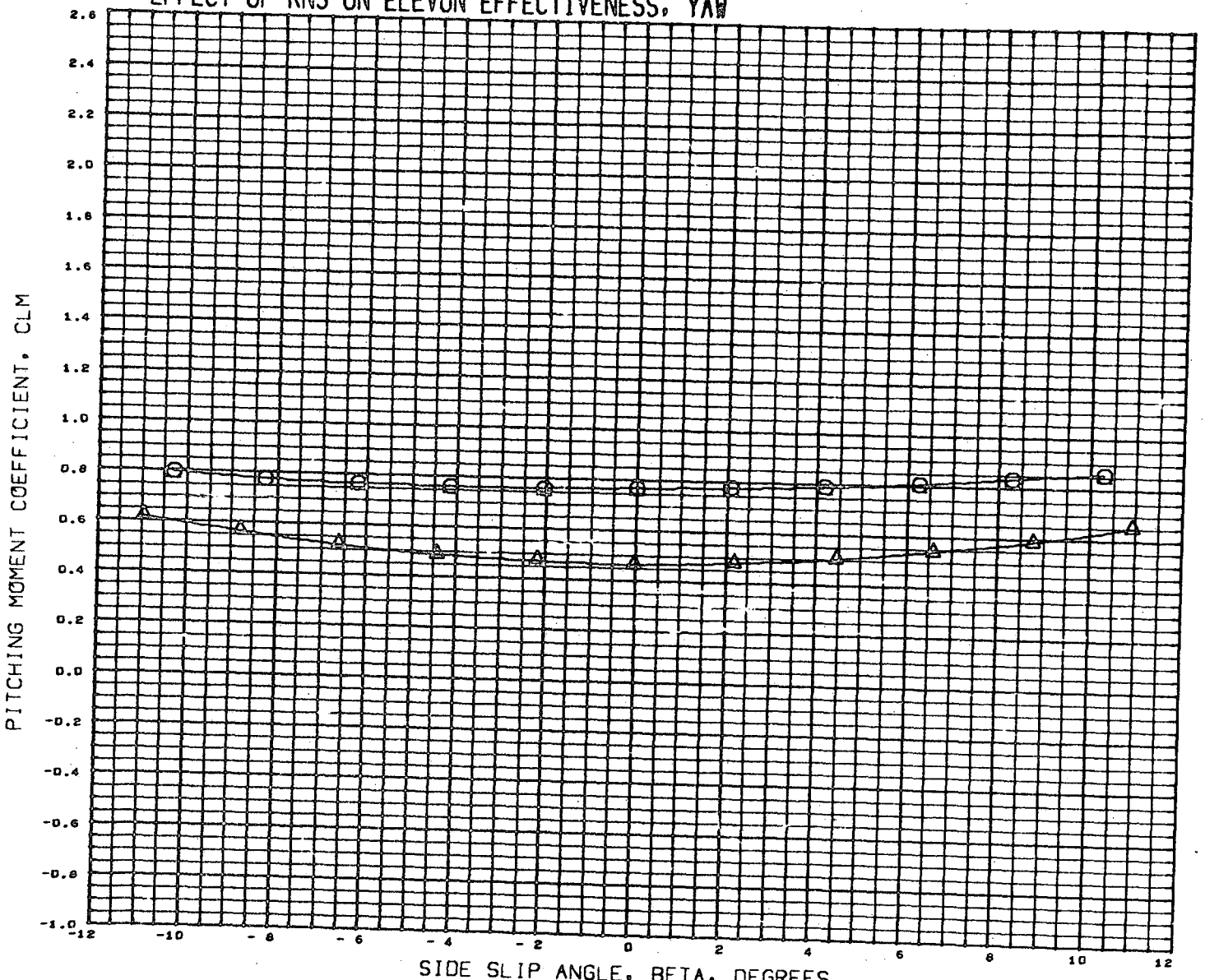
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(E3902B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(D3907B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	0.000	54.000
-6.000	0.000	0.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.202

EFFECT OF RNS ON ELEVON EFFECTIVENESS, YAW



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(E3902B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(D3907B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

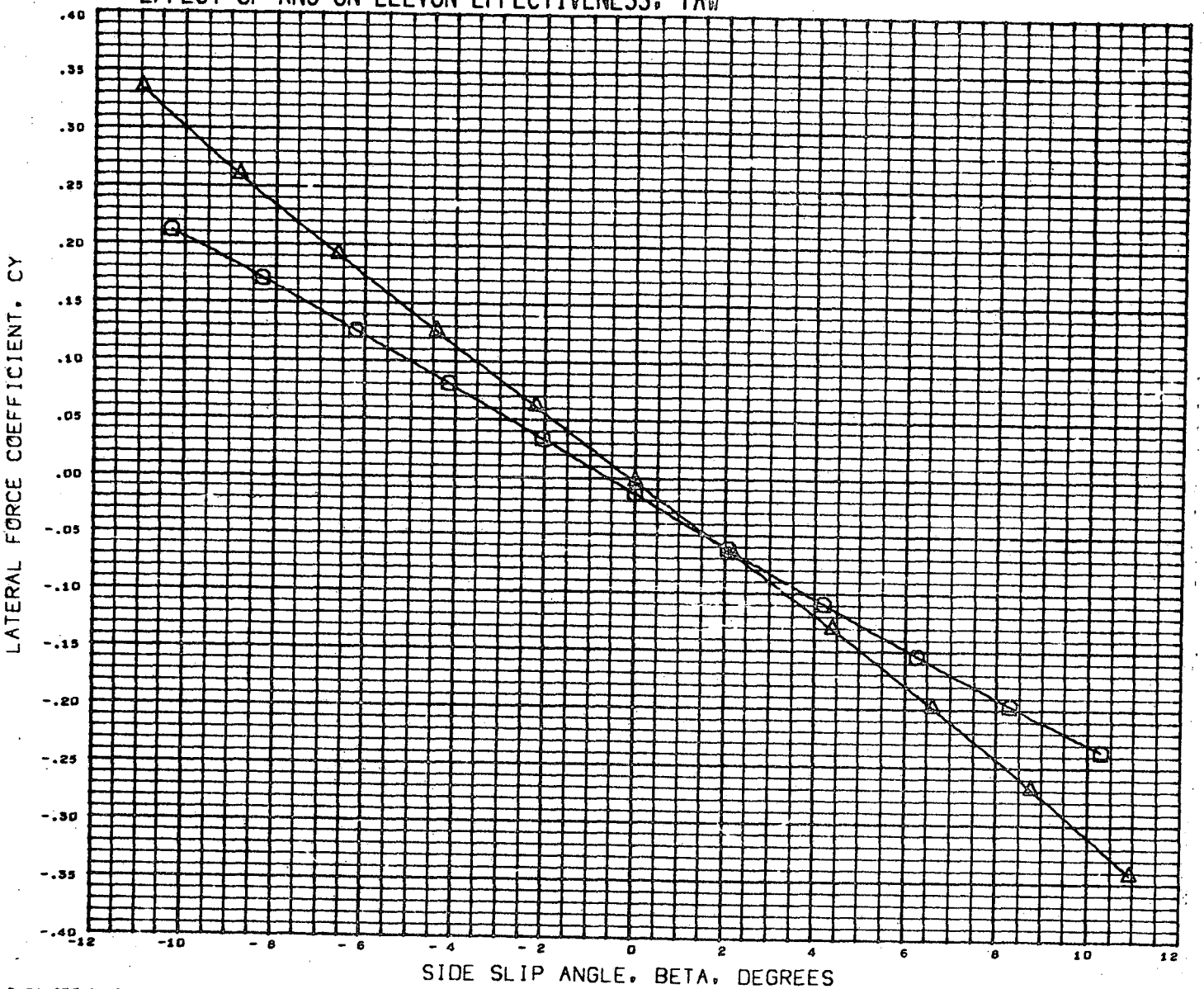
ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	0.000	54.000
-6.000	0.000	0.000	54.000

MACH 1.202

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF RNS ON ELEVON EFFECTIVENESS, YAW



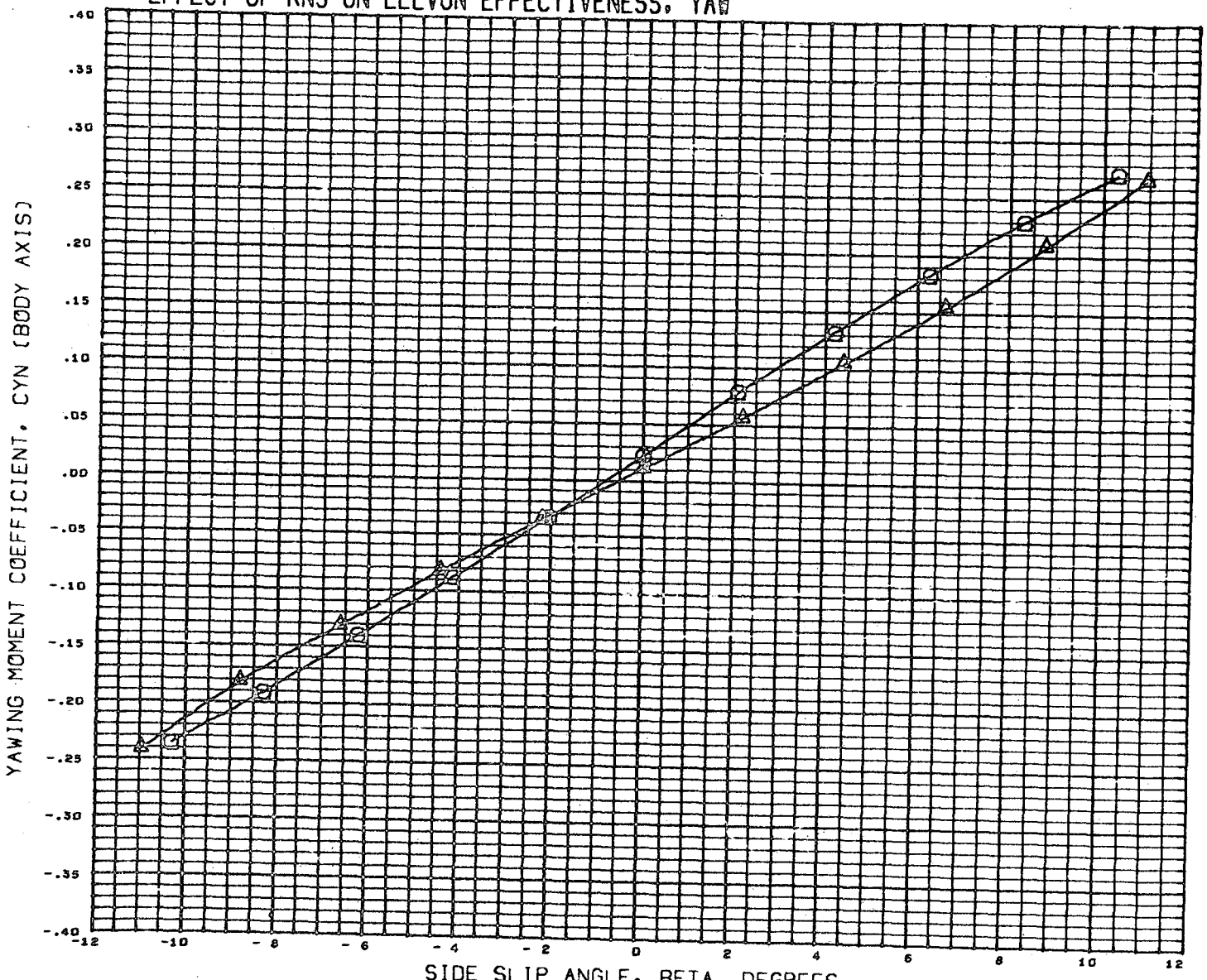
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3905B)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3906B)		MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	10.000	54.000
-6.000	0.000	10.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.195

EFFECT OF RNS ON ELEVON EFFECTIVENESS, YAW



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3905B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3908B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

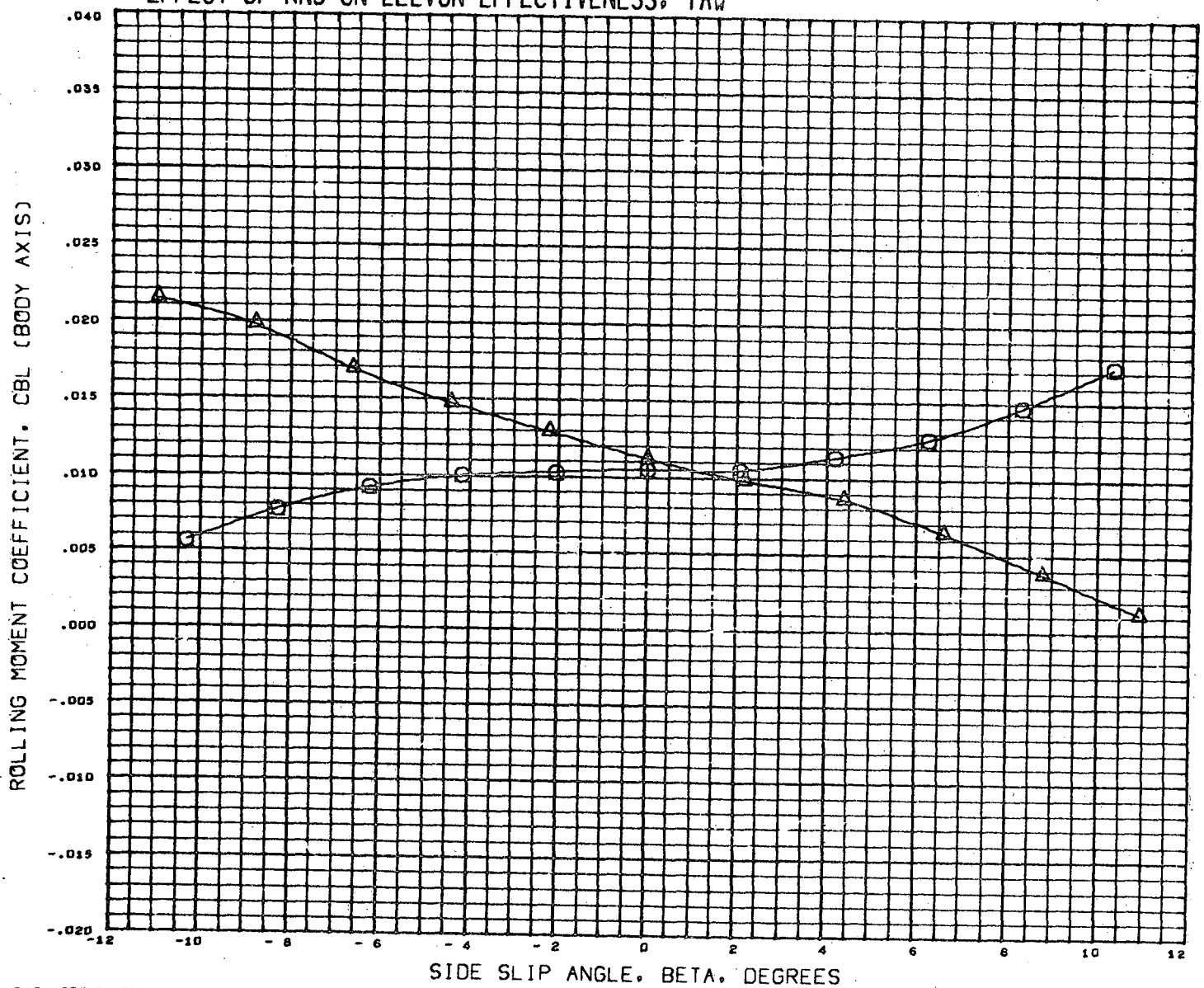
ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	10.000	54.000
-6.000	0.000	10.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.195

EFFECT OF RNS ON ELEVON EFFECTIVENESS, YAW

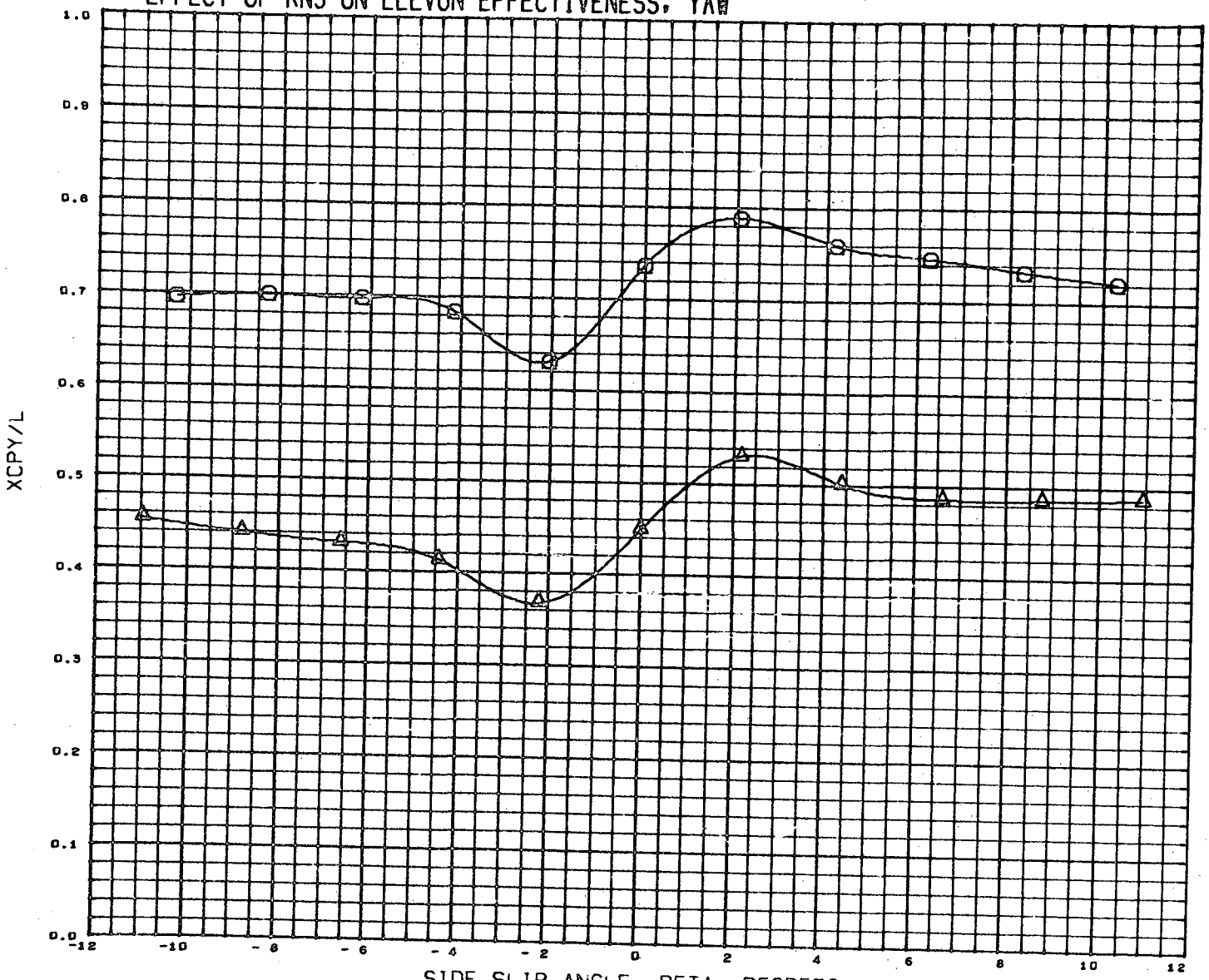


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	ELVATR	AILRON	GRIT
(C3905B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	0.000	10.000	54.000
(C3906B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	-6.000	0.000	10.000	54.000

MACH 1.195

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF RNS ON ELEVON EFFECTIVENESS, YAW



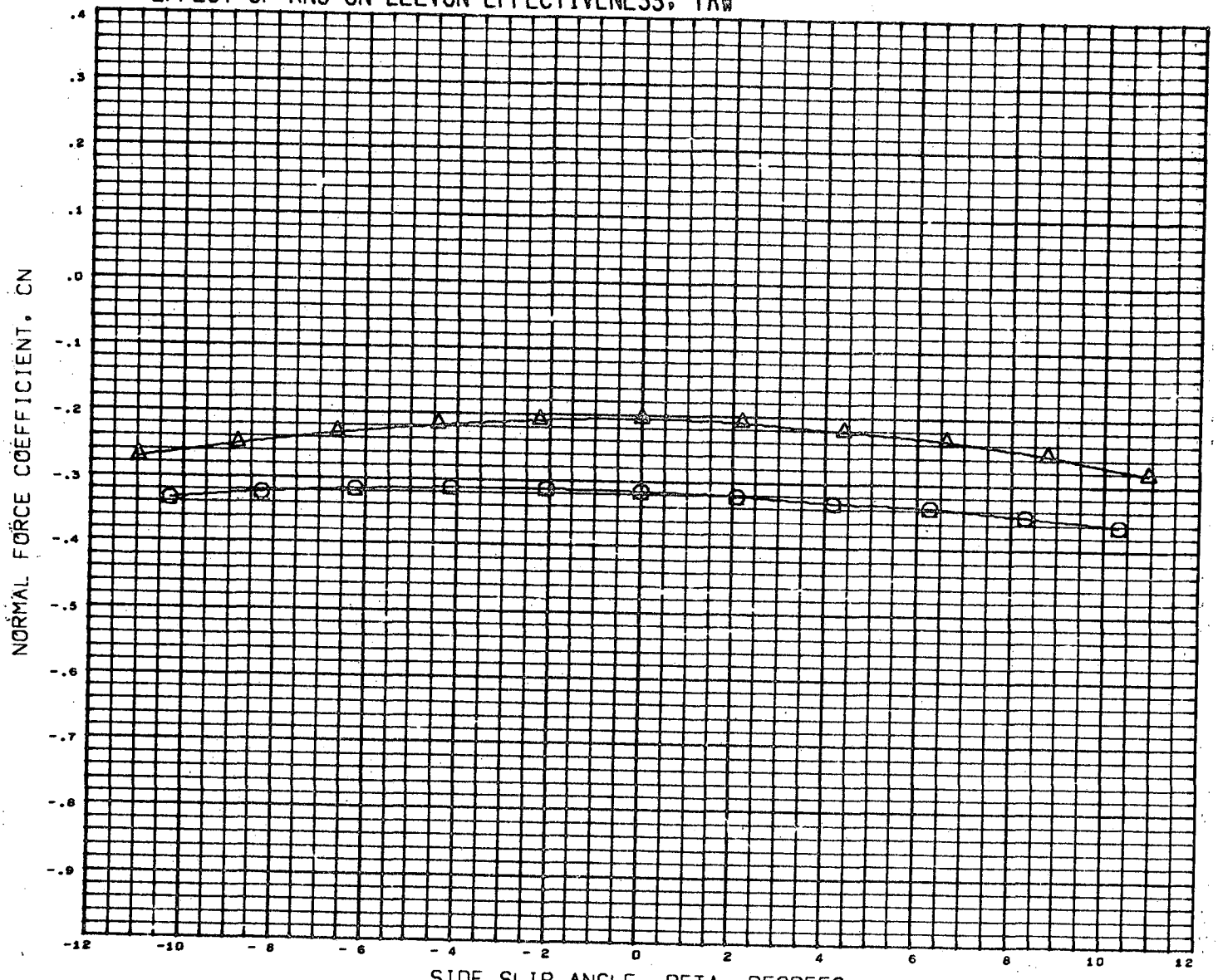
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(C3905B)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3908B)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	10.000	54.000
-6.000	0.000	10.000	54.000

MACH 1.195

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF RNS ON ELEVON EFFECTIVENESS, YAW

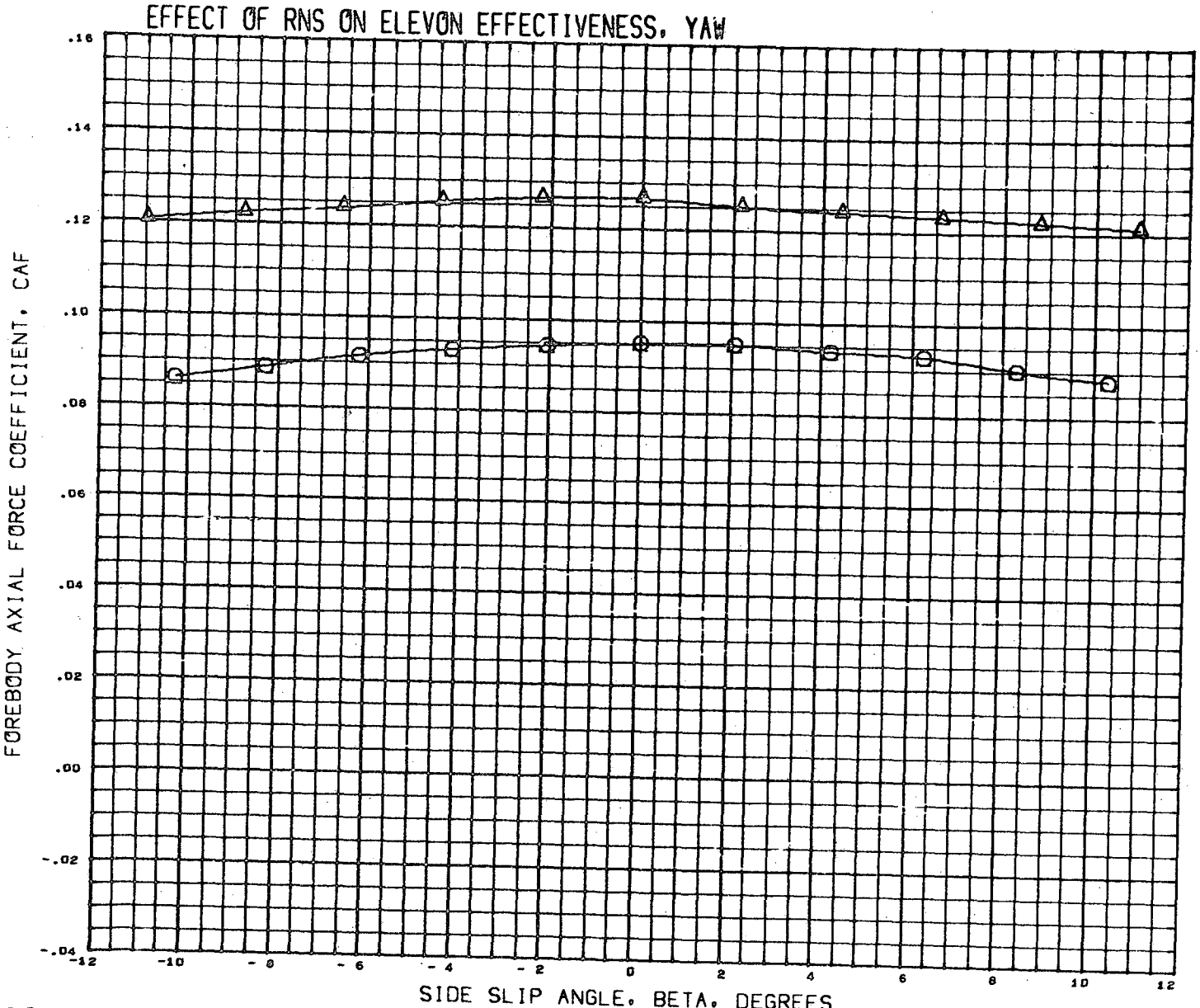


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3905B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3906B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	10.000	54.000
-6.000	0.000	10.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.195



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3905B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3908B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

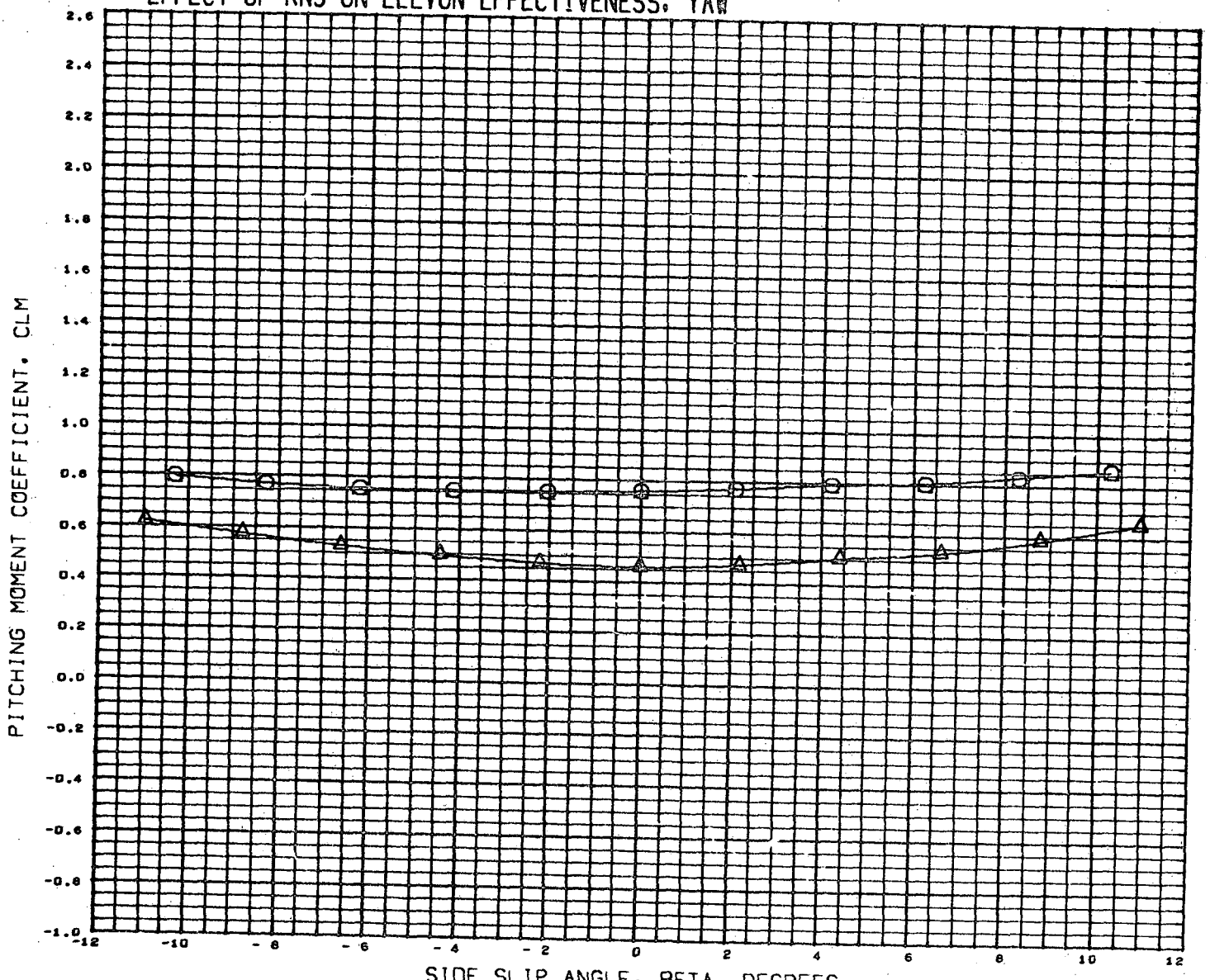
ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	10.000	54.000
-6.000	0.000	10.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.195

EFFECT OF RNS ON ELEVON EFFECTIVENESS, YAW



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3905B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3908B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

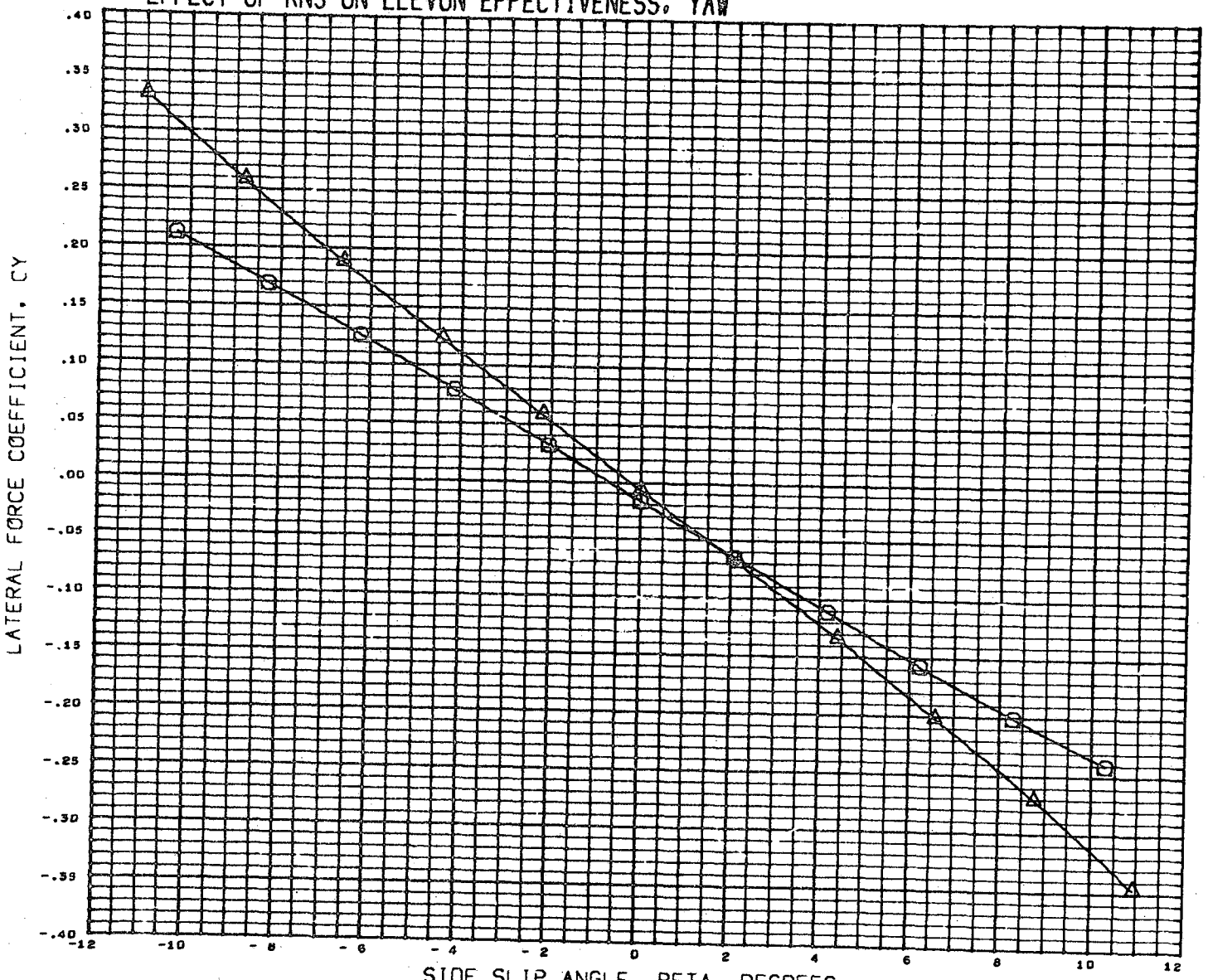
ALPHA	ELVATR	AILRON	GRIT
-6.000	0.000	10.000	54.000
-6.000	0.000	10.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.195

EFFECT OF RNS ON ELEVON EFFECTIVENESS, YAW



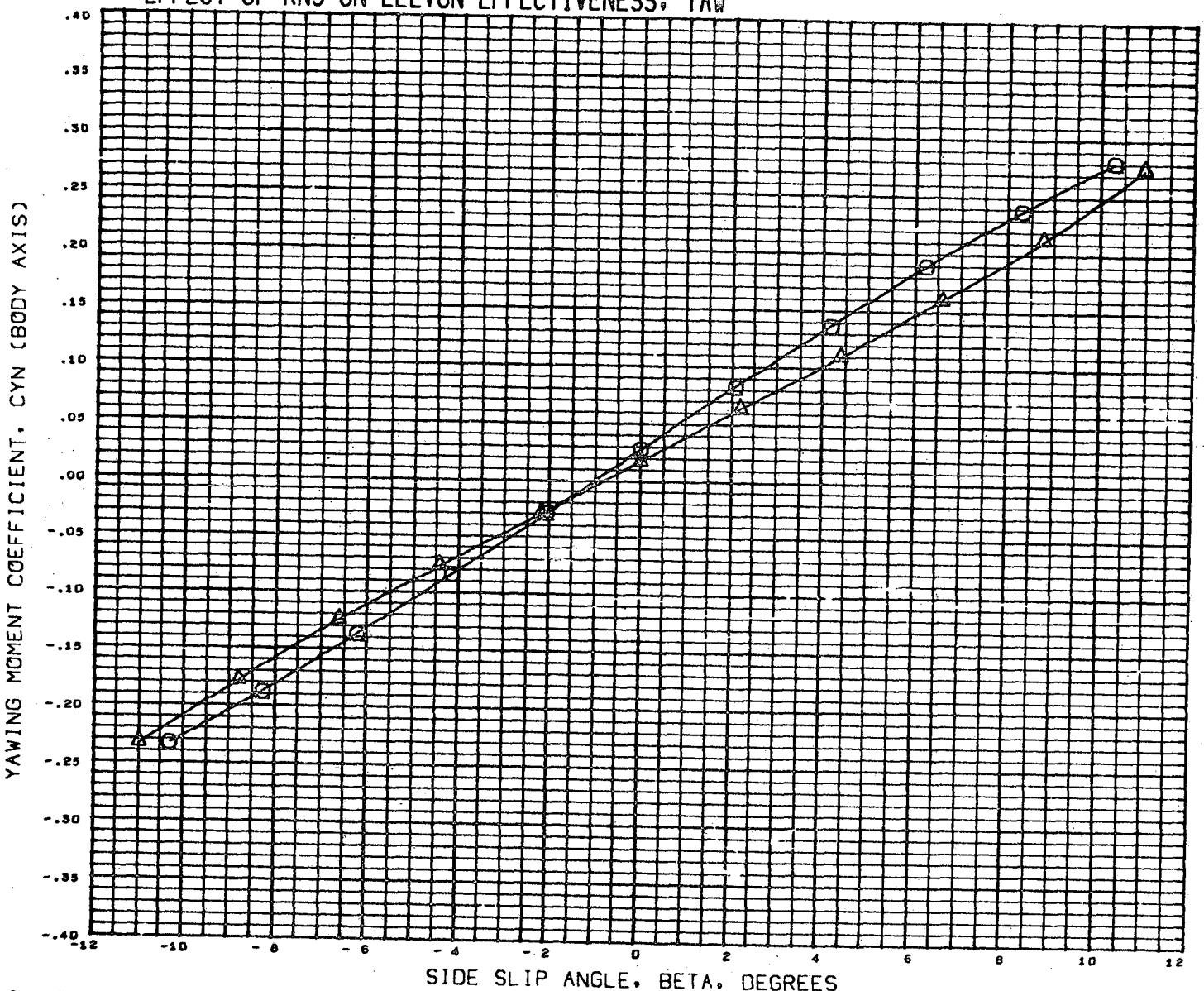
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3906B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3909B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	GRIT
-6.000	-5.000	15.000	54.000
-6.000	-5.000	15.000	54.000

MACH 1.193

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF RNS ON ELEVON EFFECTIVENESS, YAW



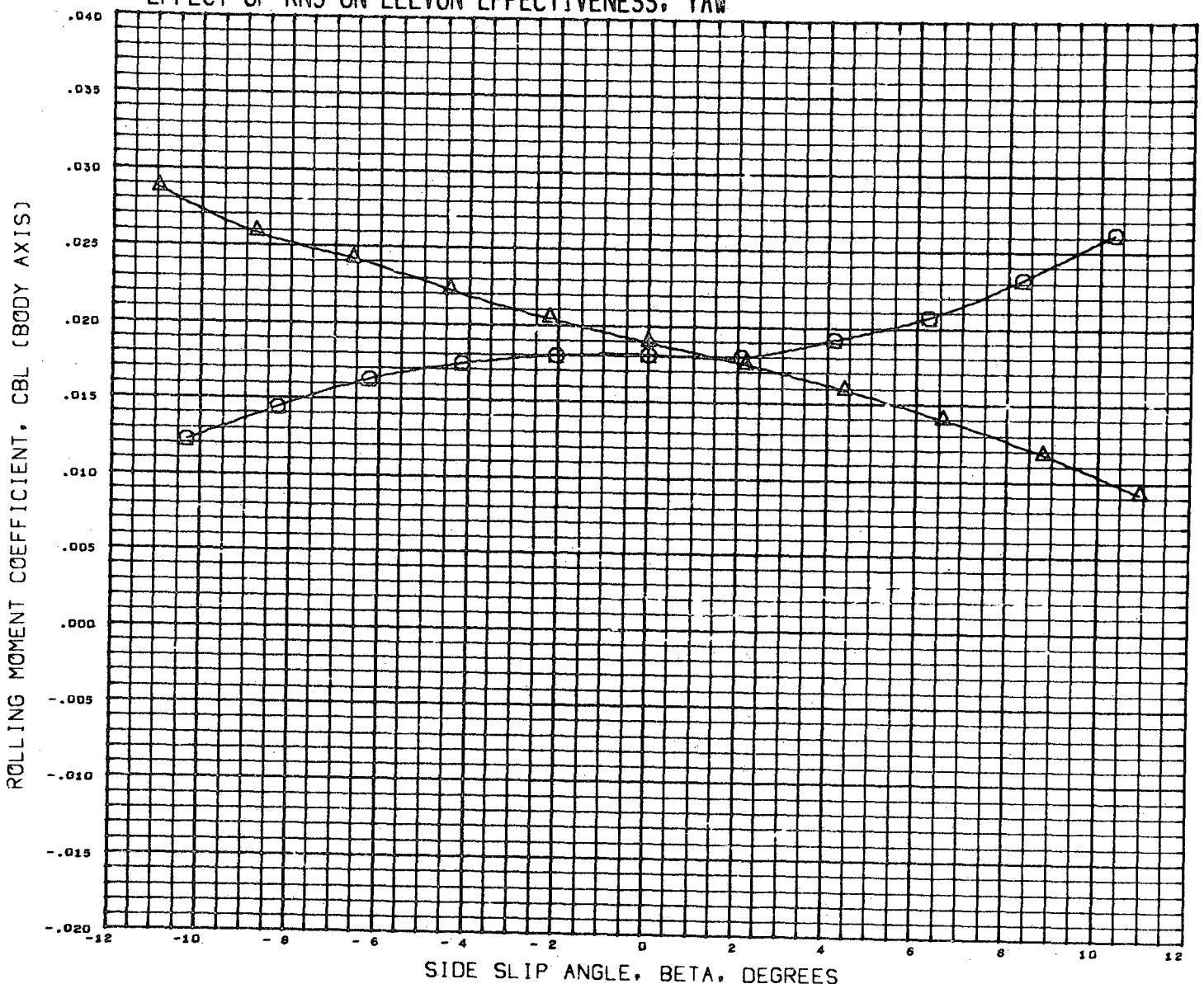
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3906B)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3909B)		MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	GRIT
-6.000	-5.000	15.000	54.000
-6.000	-5.000	15.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.193

EFFECT OF RNS ON ELEVON EFFECTIVENESS, YAW

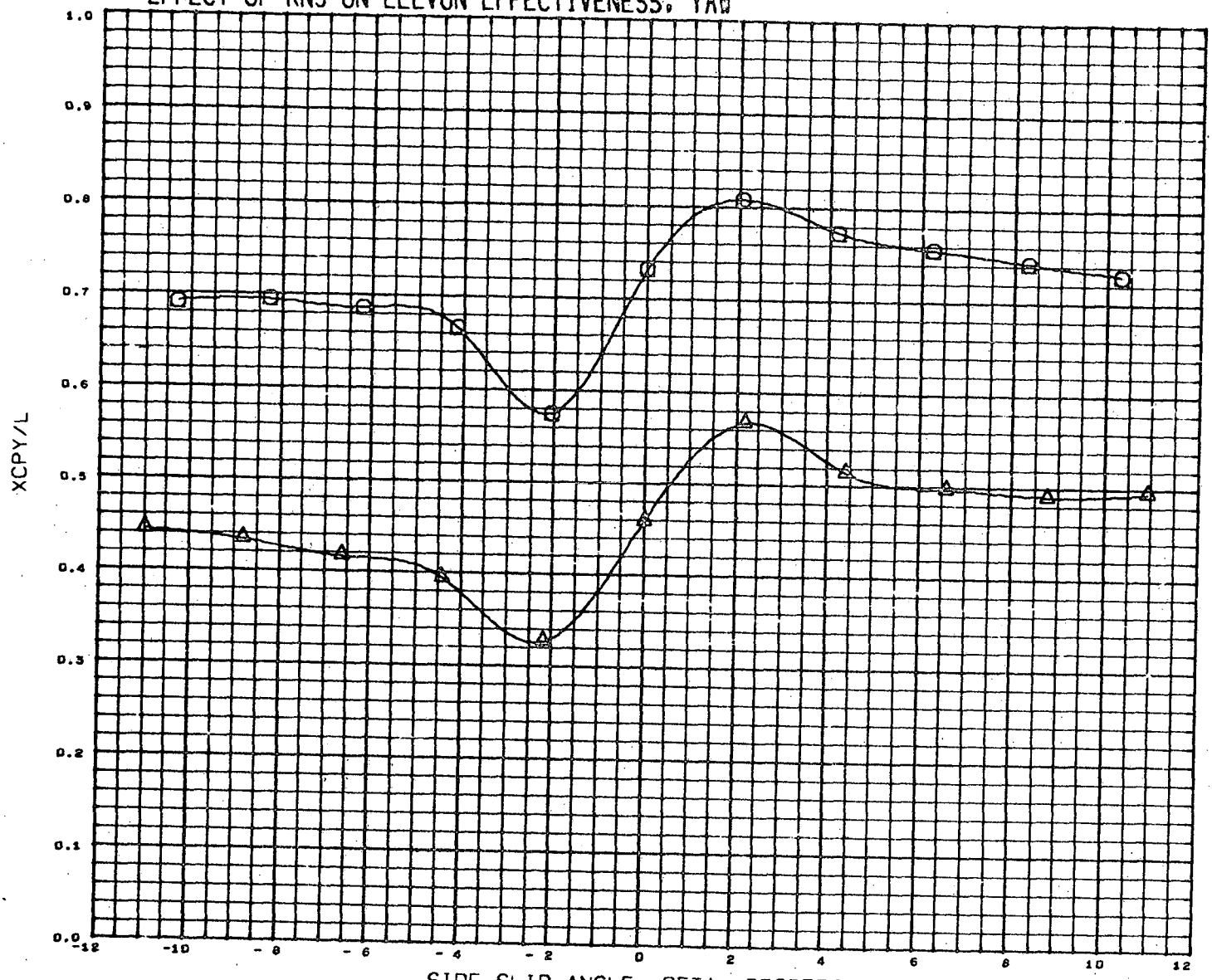


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	ELVATR	AILRON	GRIT
(C3906B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	-6.000	-5.000	15.000	54.000
(C3909B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	-6.000	-5.000	15.000	54.000

MACH 1.193

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF RNS ON ELEVON EFFECTIVENESS, YAW



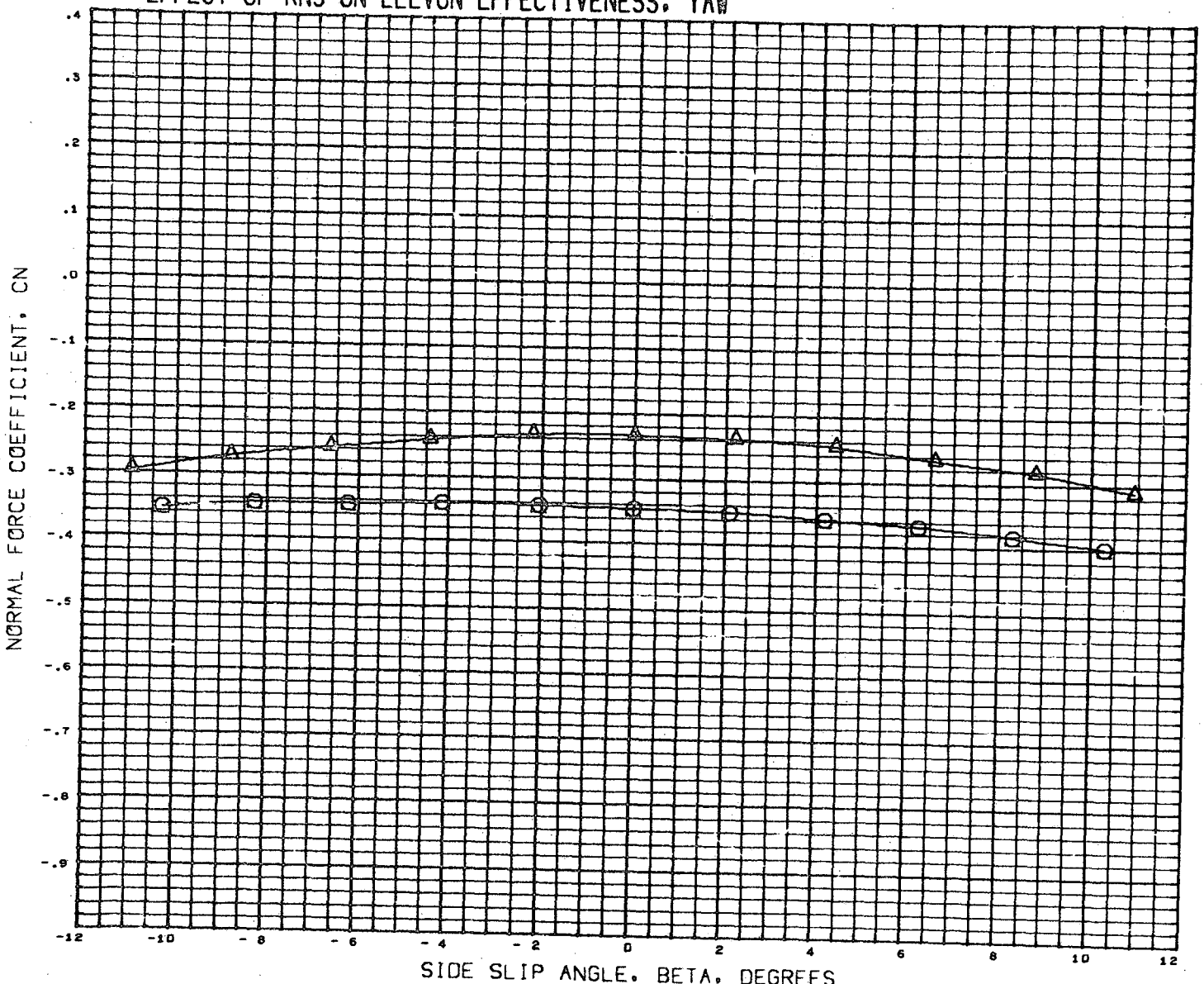
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3906B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3909B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

	ALPHA	ELVATR	AILRON	GRIT
○	-6.000	-5.000	15.000	54.000
△	-6.000	-5.000	15.000	54.000

MACH 1.193

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF RNS ON ELEVON EFFECTIVENESS, YAW



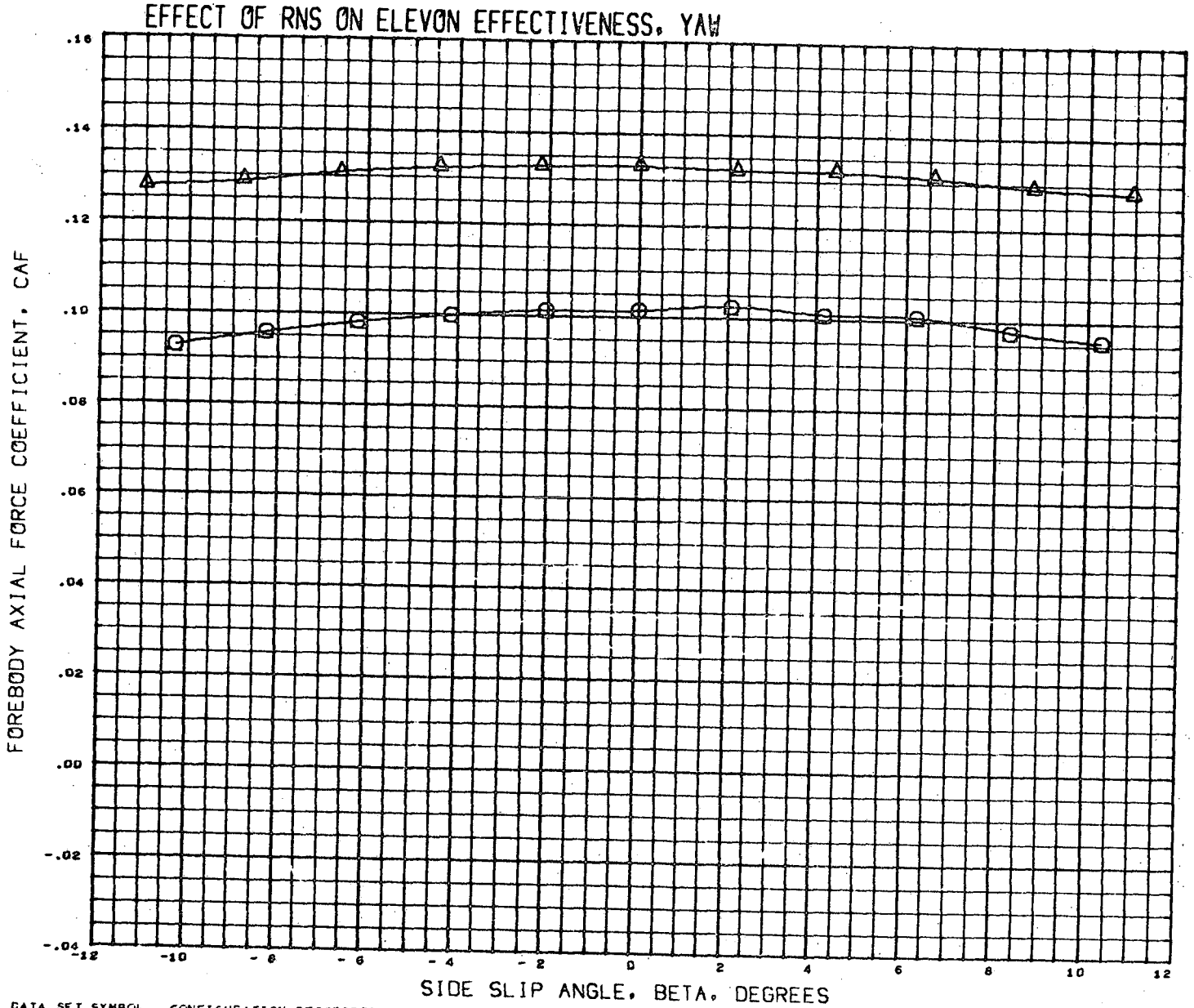
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3906B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3909B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	GRIT
-6.000	-5.000	15.000	54.000
-6.000	-5.000	15.000	54.000

MACH 1.193

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE



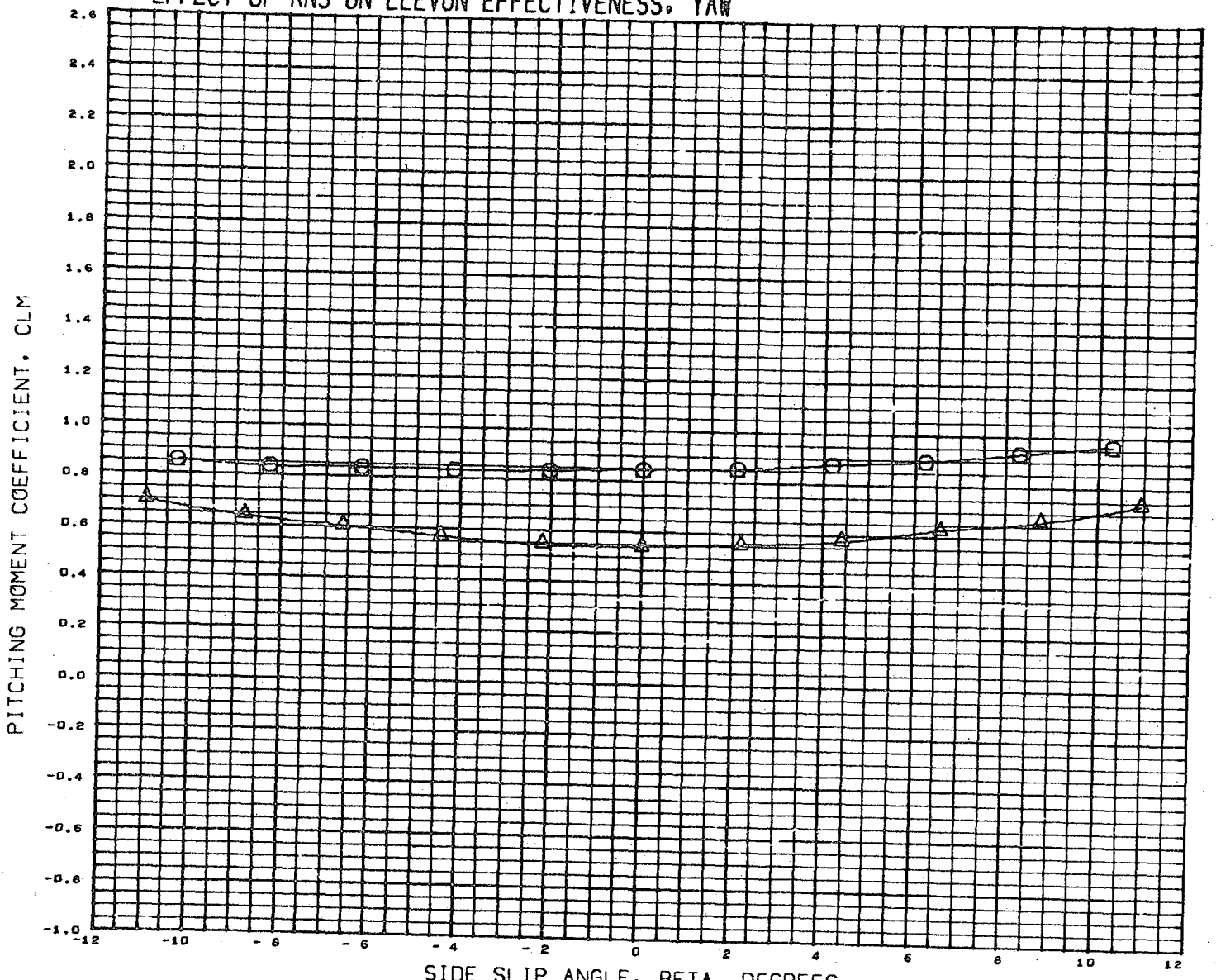
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3906B)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3909B)		MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	GRIT
-6.000	-5.000	15.000	54.000
-6.000	-5.000	15.000	54.000

MACH 1.193

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF RNS ON ELEVON EFFECTIVENESS, YAW



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3906B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3909B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

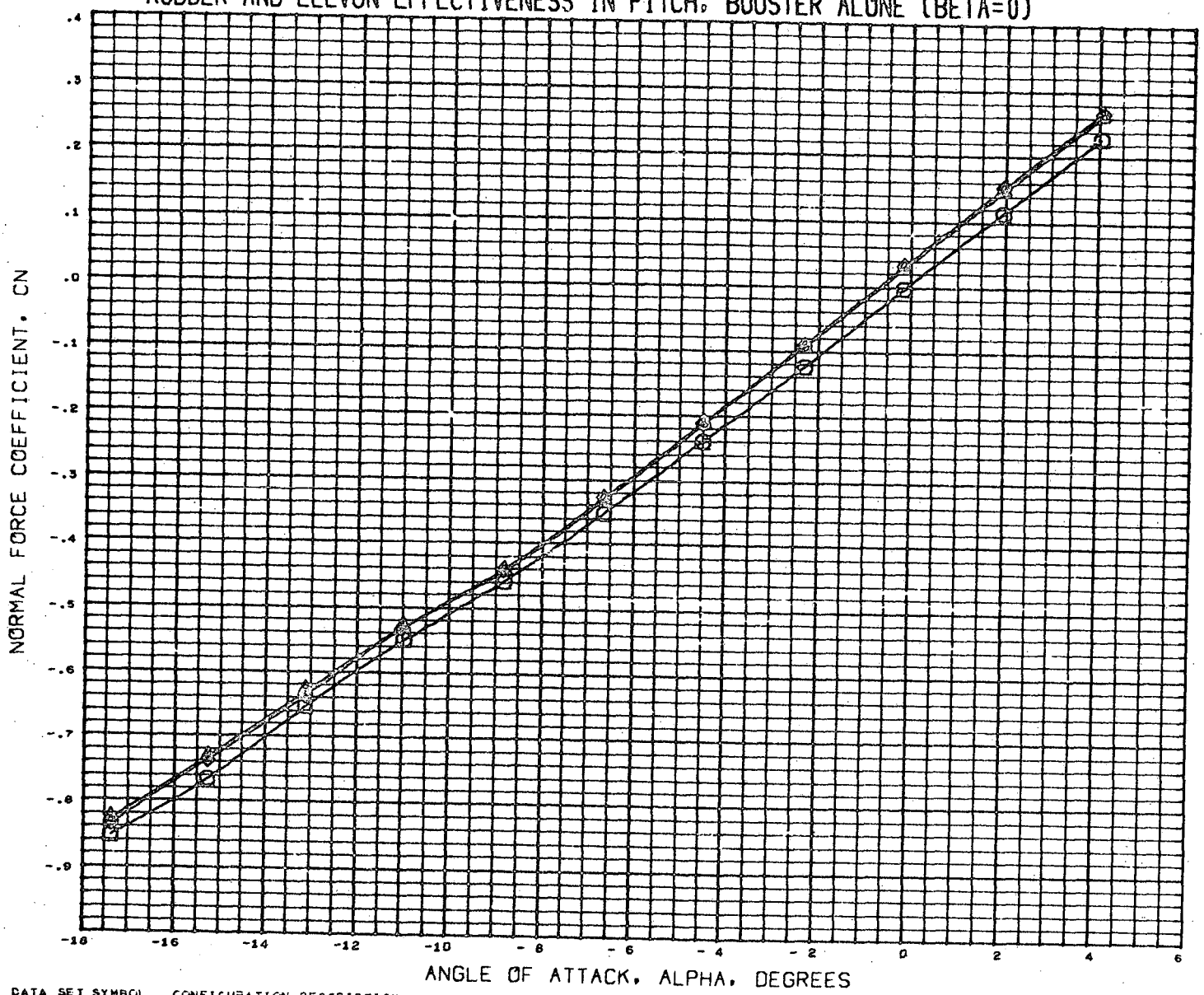
ALPHA	ELVATR	AILRON	GRIT
-6.000	-5.000	15.000	54.000
-6.000	-5.000	15.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.193

RUDDER AND ELEVON EFFECTIVENESS IN PITCH, BOOSTER ALONE (BETA=0)

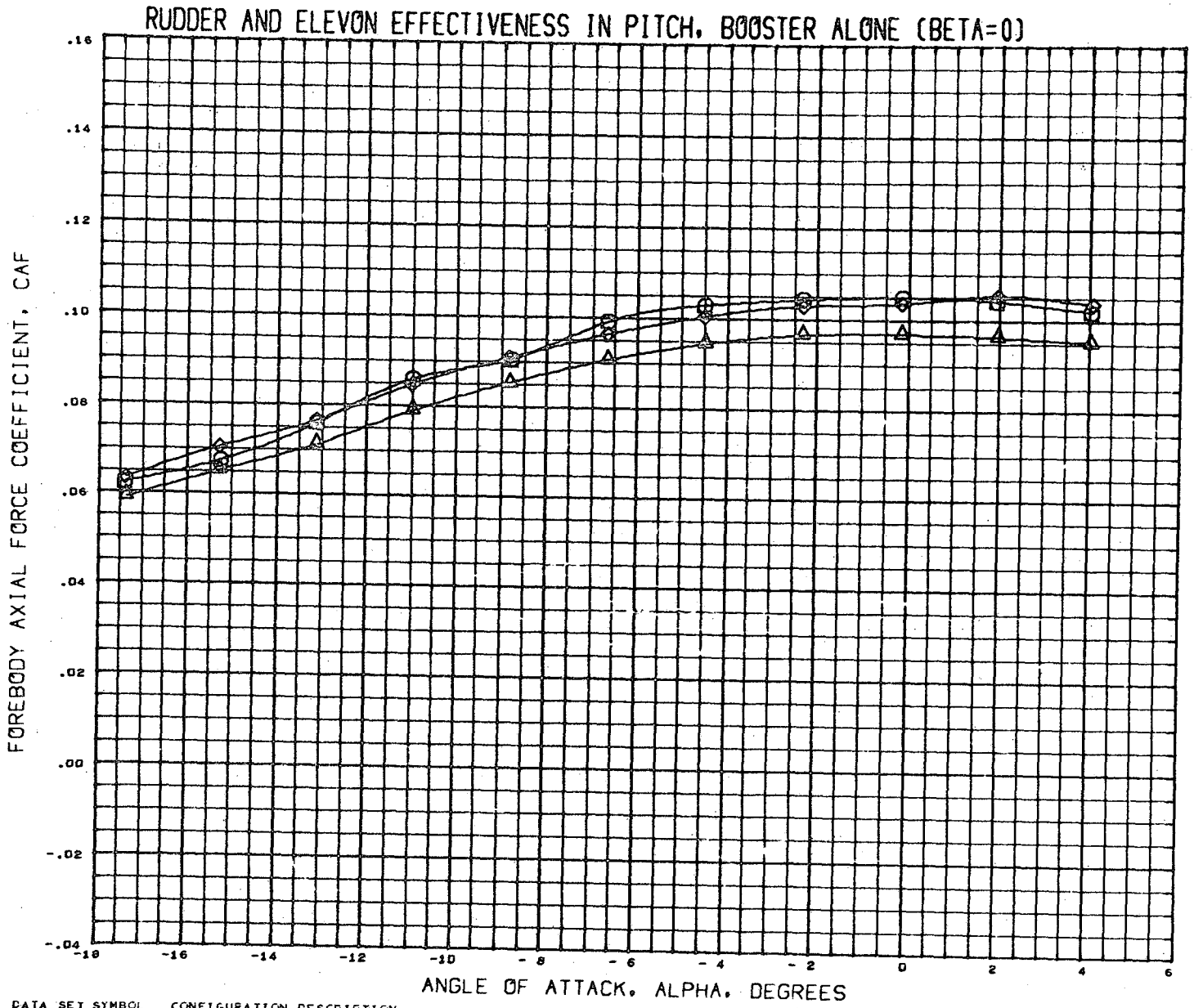


DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(B3902A)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3903A)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3904A)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

ELVATR	AILRON	RUDDER	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	10.000	10.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.197



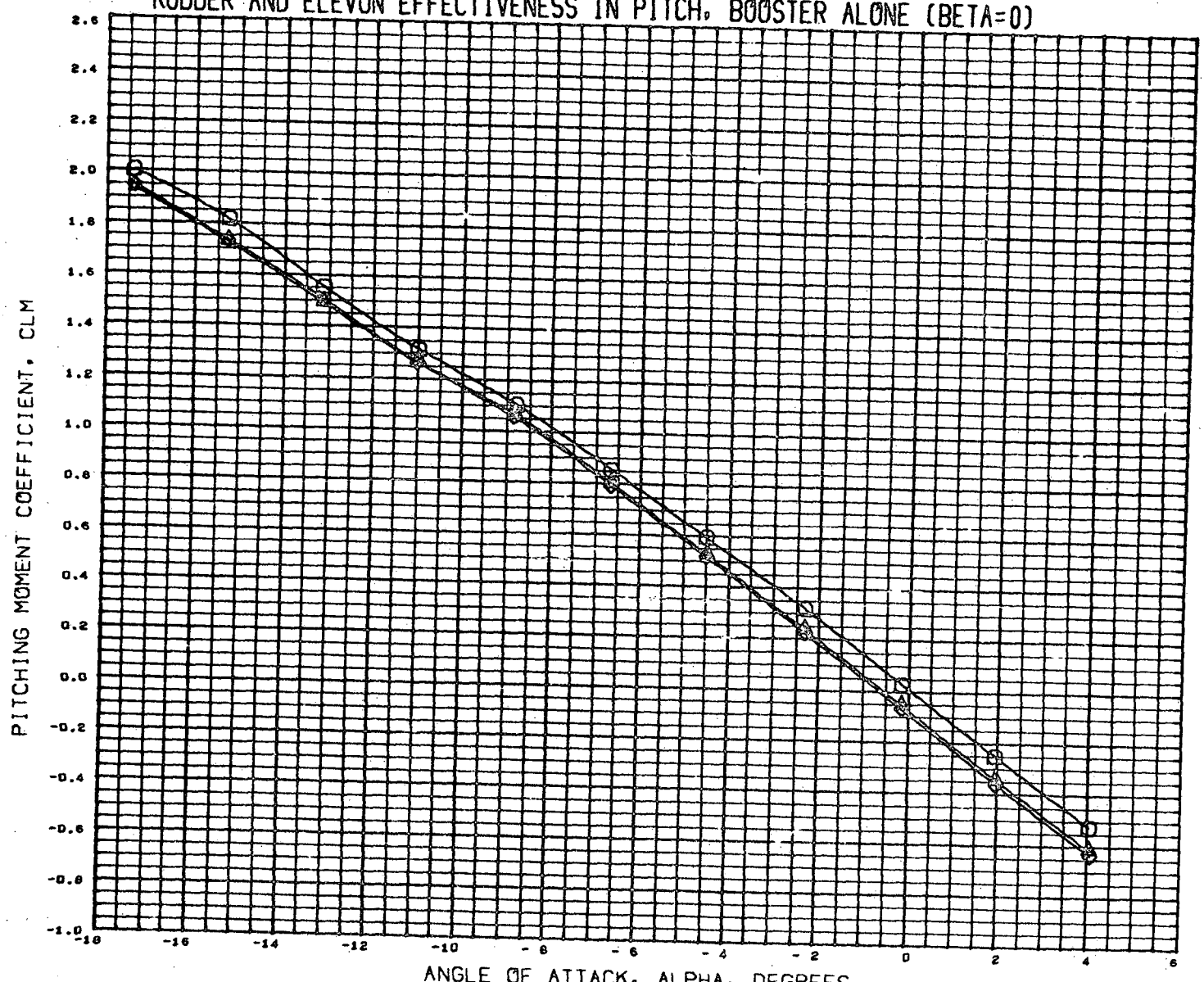
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(B39D2A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A39D3A)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A39D4A)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

ELVATR	AILRON	RUDDER	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	10.000	10.000	54.000

MACH 1.197

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

RUDDER AND ELEVON EFFECTIVENESS IN PITCH, BOOSTER ALONE (BETA=0)



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(B3902A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3903A)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3904A)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

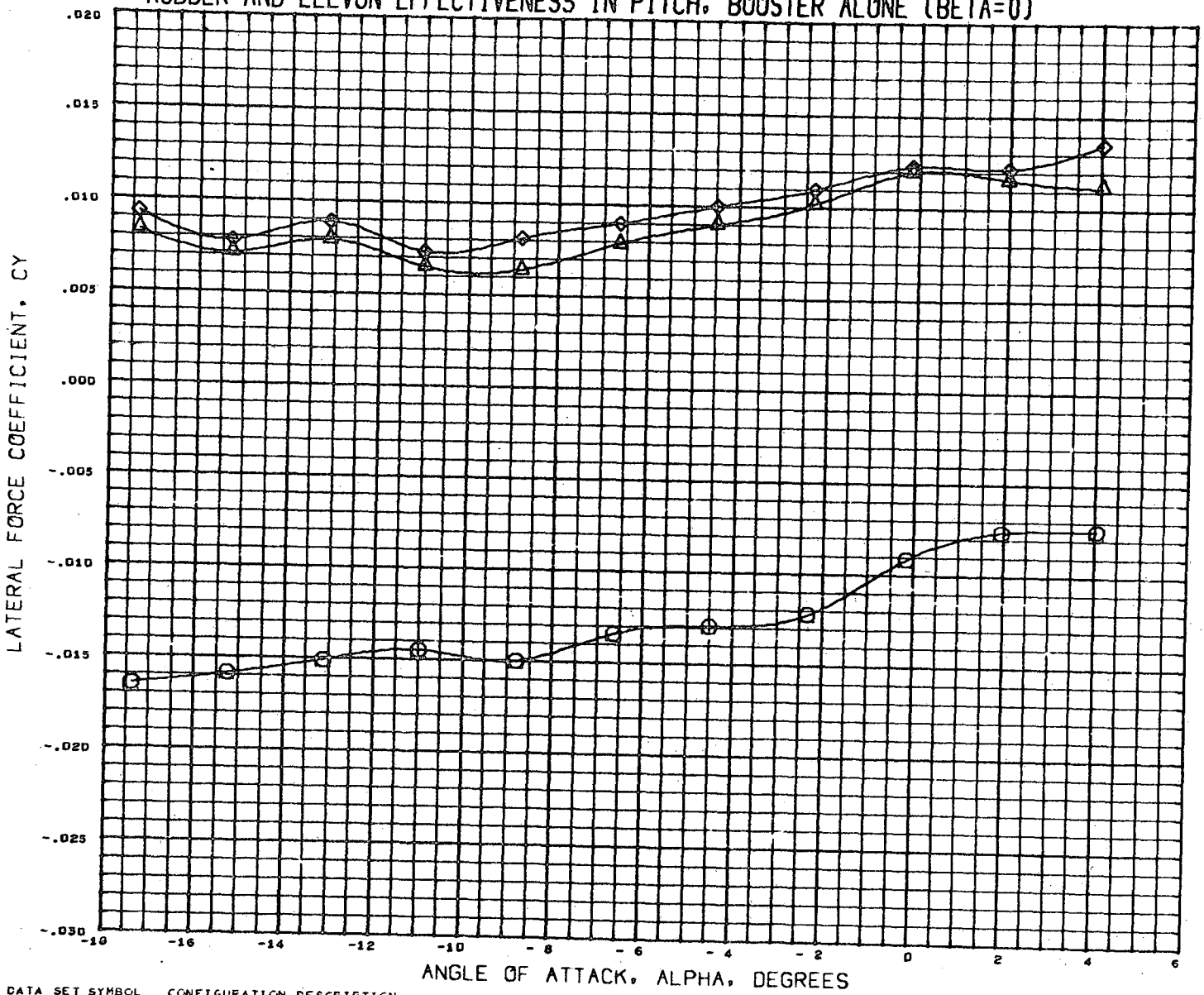
MACH 1.197

ELVATR	AILRON	RUDDER	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	10.000	10.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

RUDDER AND ELEVON EFFECTIVENESS IN PITCH, BOOSTER ALONE (BETA=0)



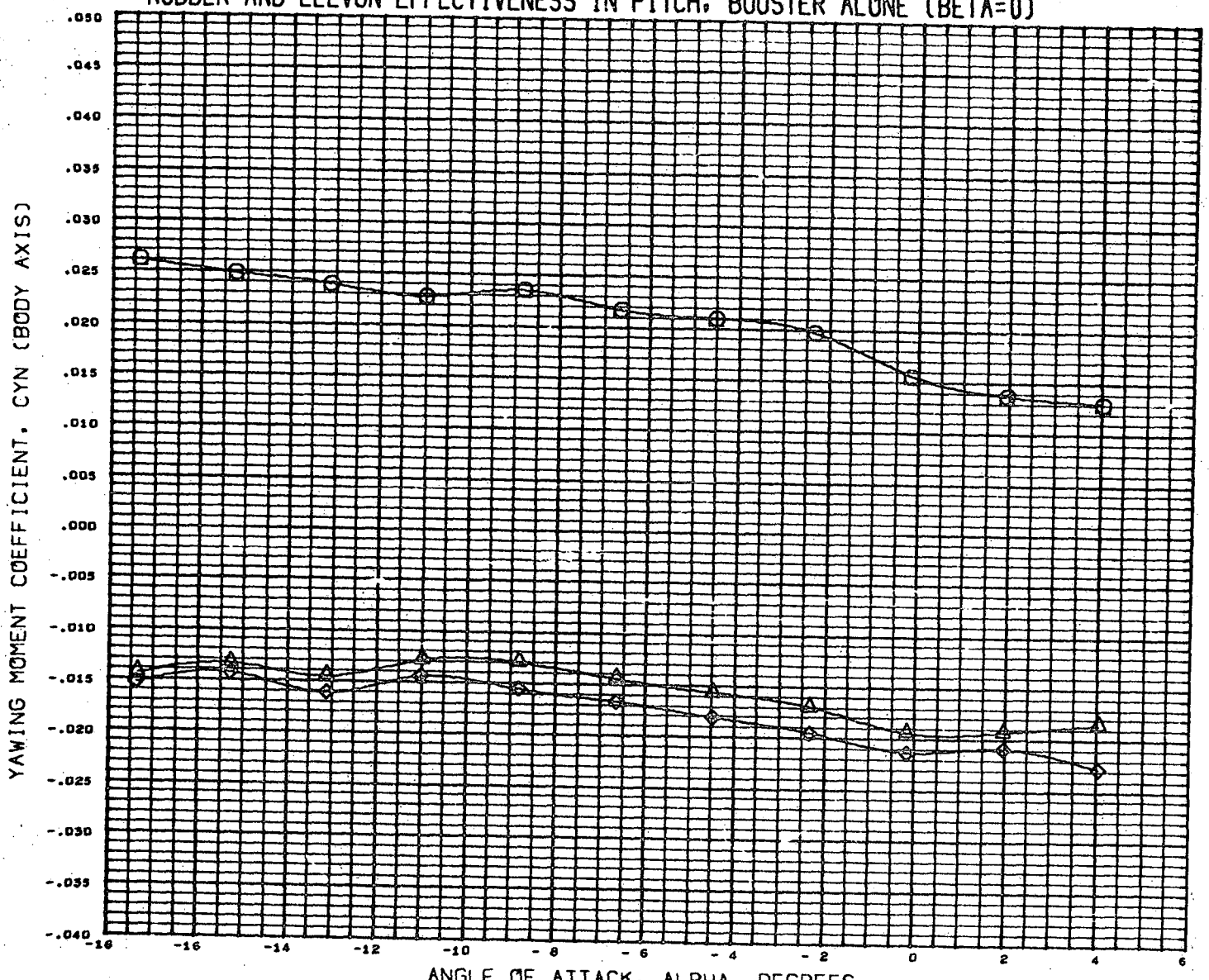
DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(B3902A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3903A)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3904A)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

ELVATR	AILRON	RUDDER	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	10.000	10.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.197

RUDDER AND ELEVON EFFECTIVENESS IN PITCH, BOOSTER ALONE (BETA=0)



DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(B3902A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3903A)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3904A)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

ELVATR	AILRON	RUDDER	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	10.000	10.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.197

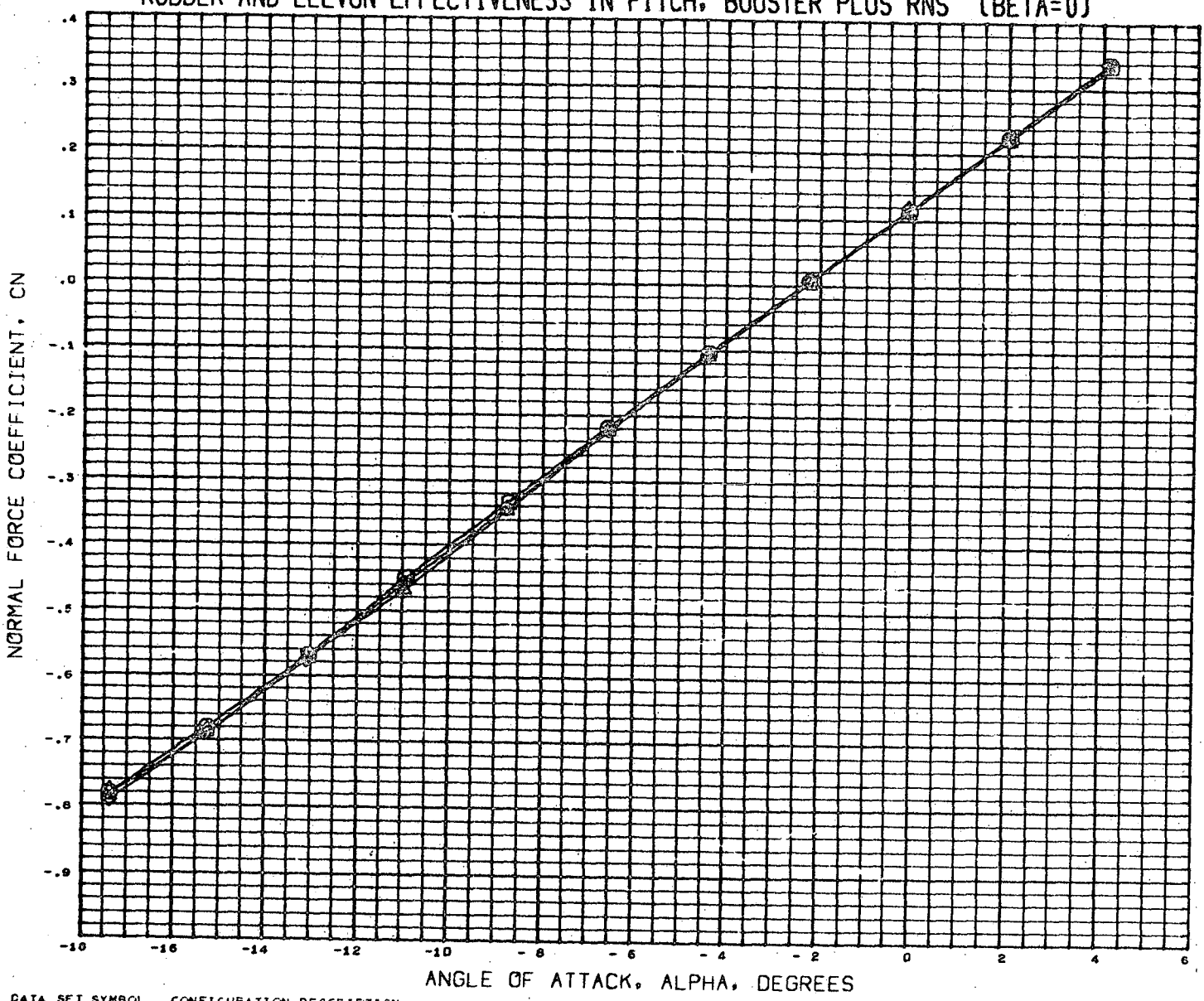
RUDDER AND ELEVON EFFECTIVENESS IN PITCH, BOOSTER ALONE (BETA=0)

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ELVATR	AILRON	RUDDER	GRIT
(B3902A)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	0.000	0.000	0.000	54.000
(A3903A)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	0.000	0.000	10.000	54.000
(A3904A)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	0.000	10.000	10.000	54.000

MACH 1.197

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

RUDDER AND ELEVON EFFECTIVENESS IN PITCH, BOOSTER PLUS RNS (BETA=0)



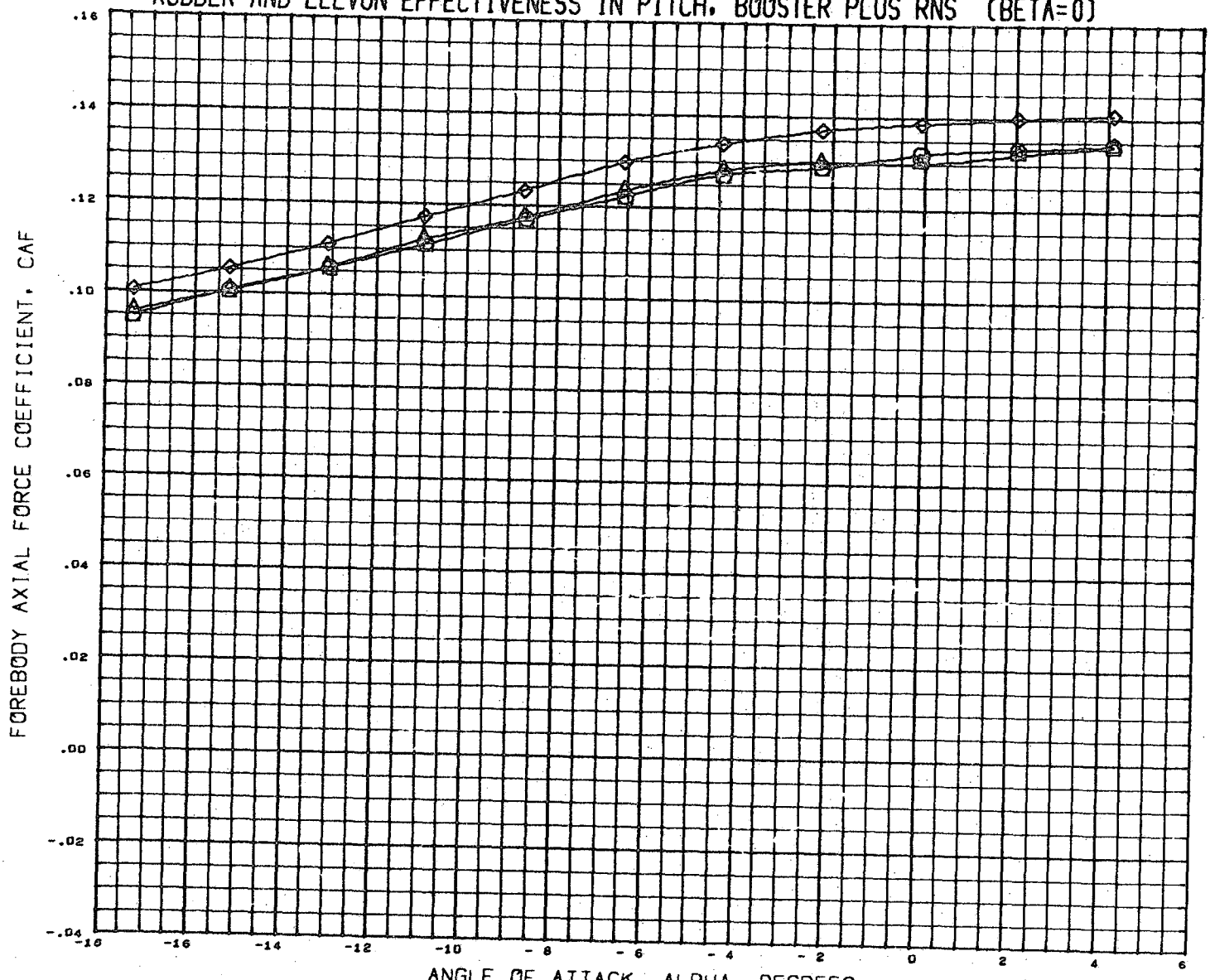
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(B3907A)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(A3911A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(A3910A)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ELVATR	AILRON	RUDDER	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	10.000	10.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.194

RUDDER AND ELEVON EFFECTIVENESS IN PITCH, BOOSTER PLUS RNS (BETA=0)



DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(B3907A)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(A3911A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(A3910A)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

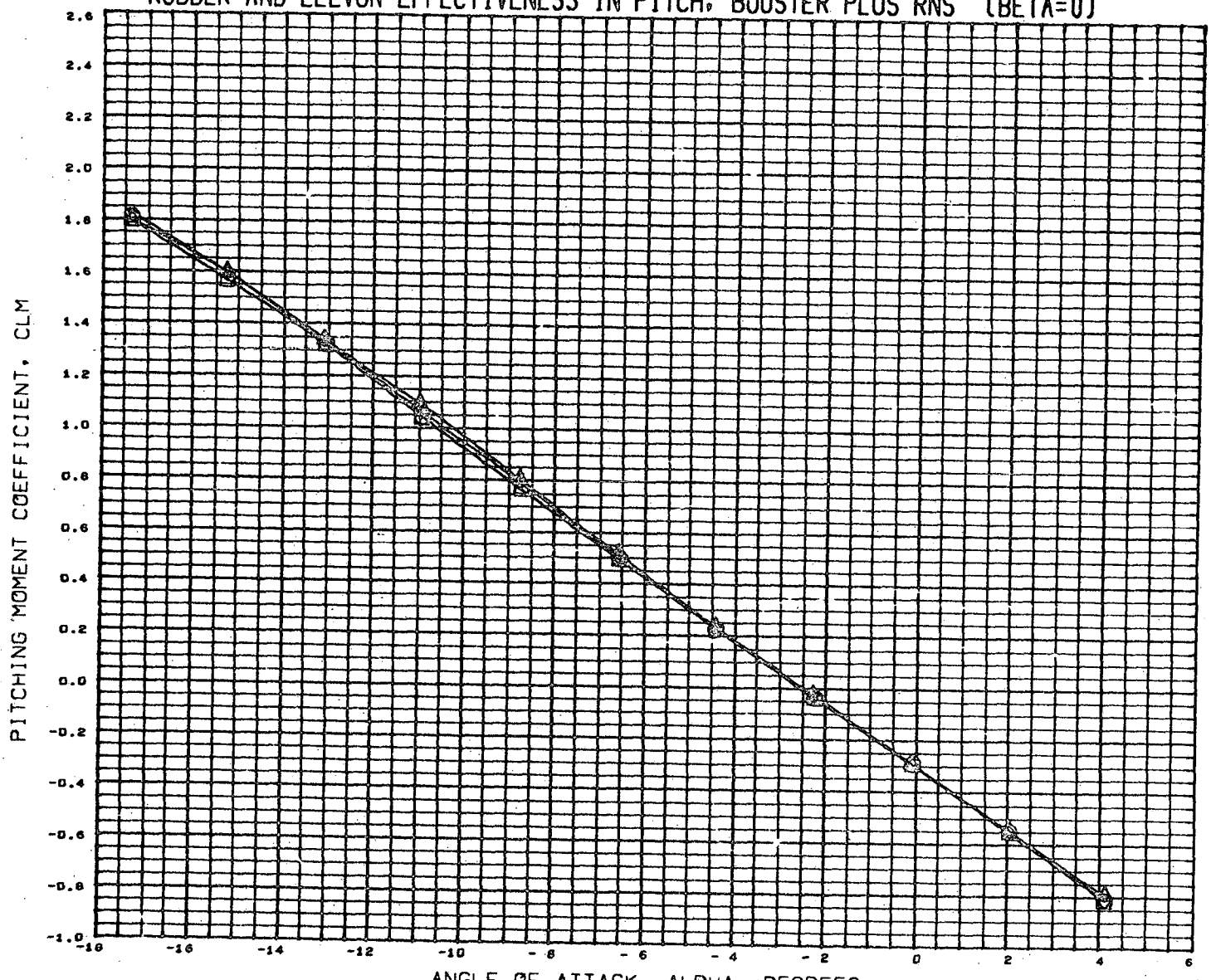
ELVATR	AILRON	RUDDER	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	10.000	10.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.194

RUDDER AND ELEVON EFFECTIVENESS IN PITCH, BOOSTER PLUS RNS (BETA=0)

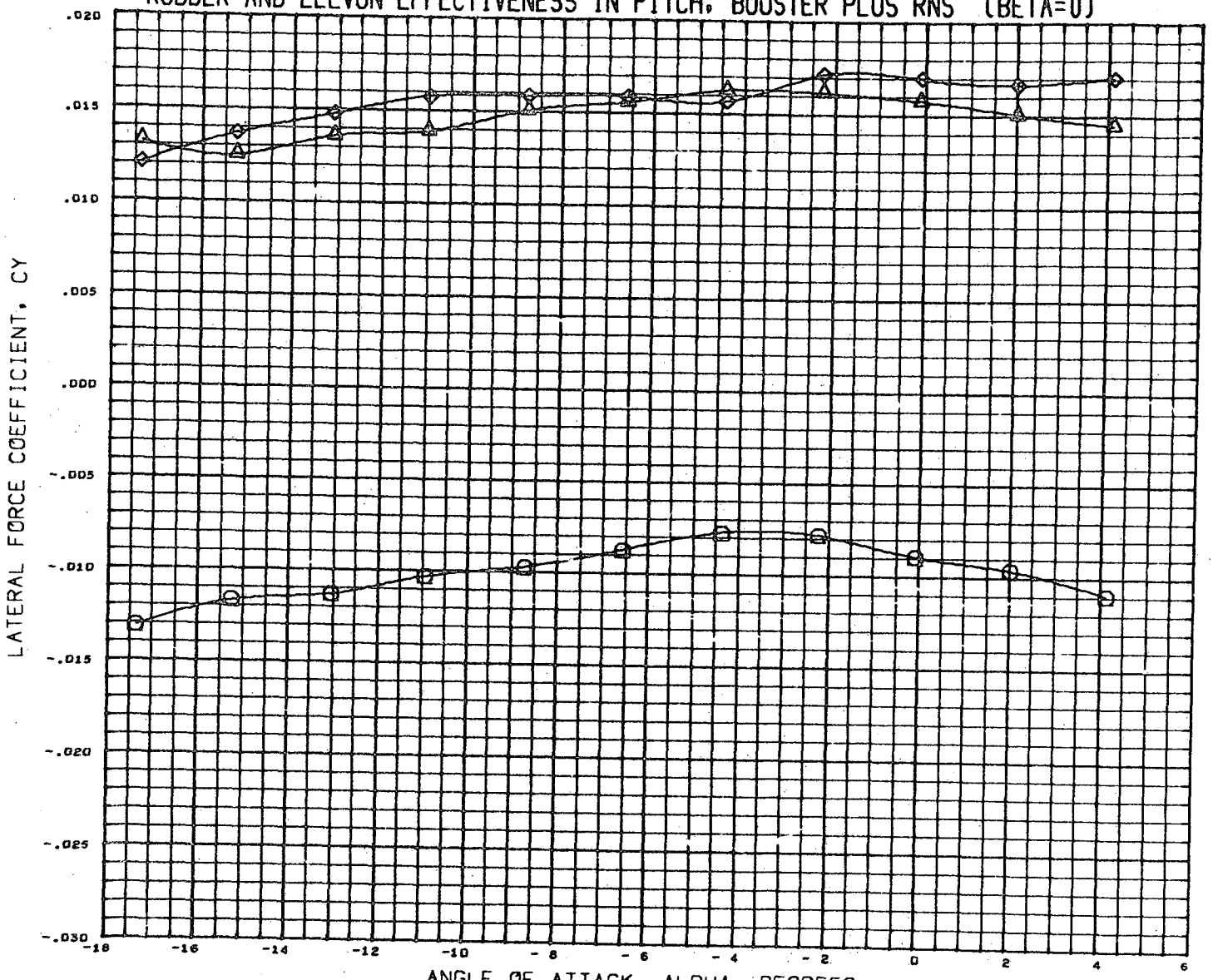


DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ELVATR	AILRON	RUDDER	GRIT
(B3907A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	0.000	0.000	54.000
(A3911A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	0.000	10.000	54.000
(A3910A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	10.000	10.000	54.000

MACH 1.194

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

RUDDER AND ELEVON EFFECTIVENESS IN PITCH, BOOSTER PLUS RNS (BETA=0)



DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(B3907A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(A3911A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(A3910A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

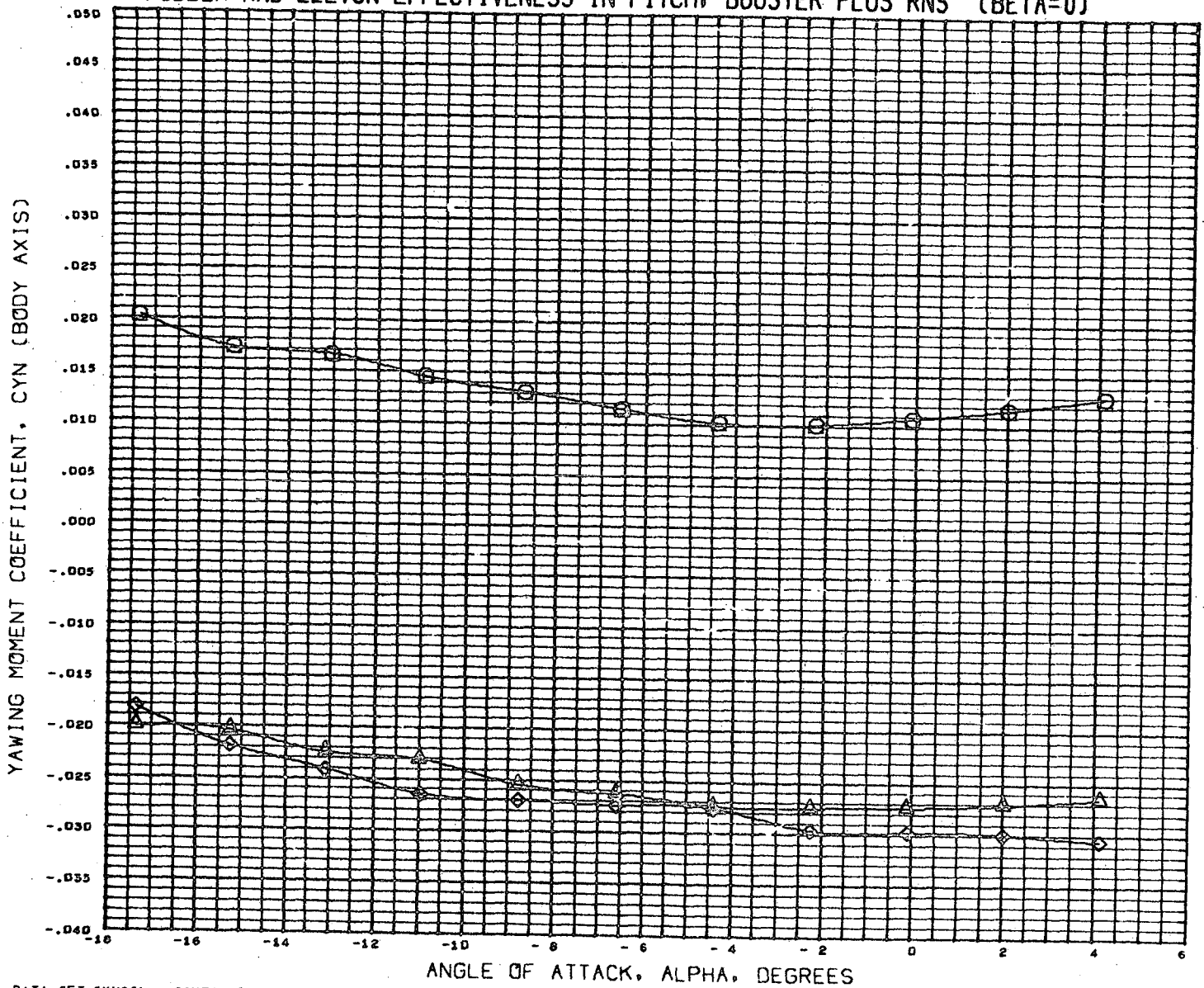
ELVATR	AILRON	RUDDER	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	10.000	10.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.194

RUDDER AND ELEVON EFFECTIVENESS IN PITCH, BOOSTER PLUS RNS (BETA=0)



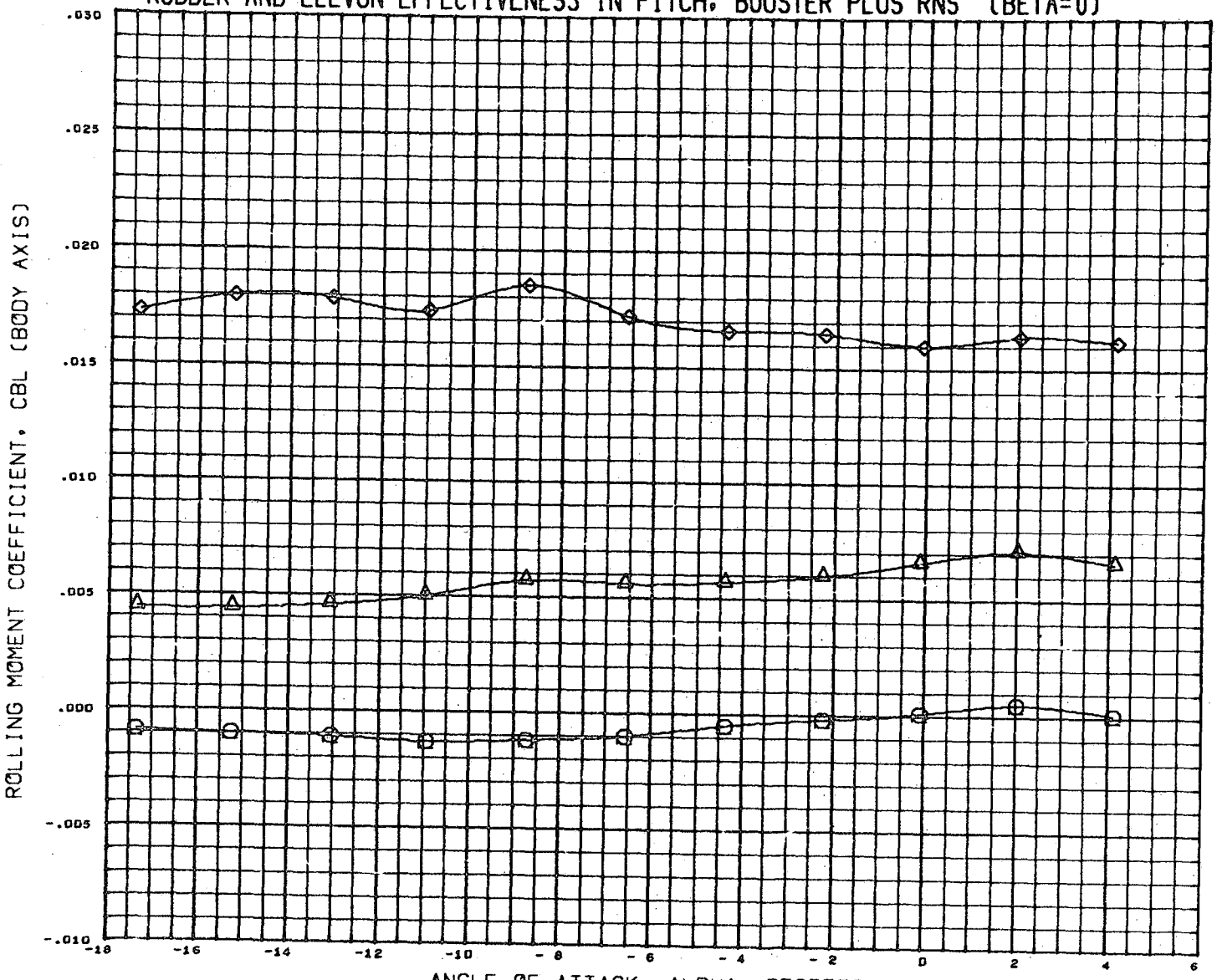
DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(B3907A)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(A3911A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(A3910A)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ELVATR	AILRON	RUDDER	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	10.000	10.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.194

RUDDER AND ELEVON EFFECTIVENESS IN PITCH, BOOSTER PLUS RNS (BETA=0)



DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(B3907A)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(A3911A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(A3910A)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

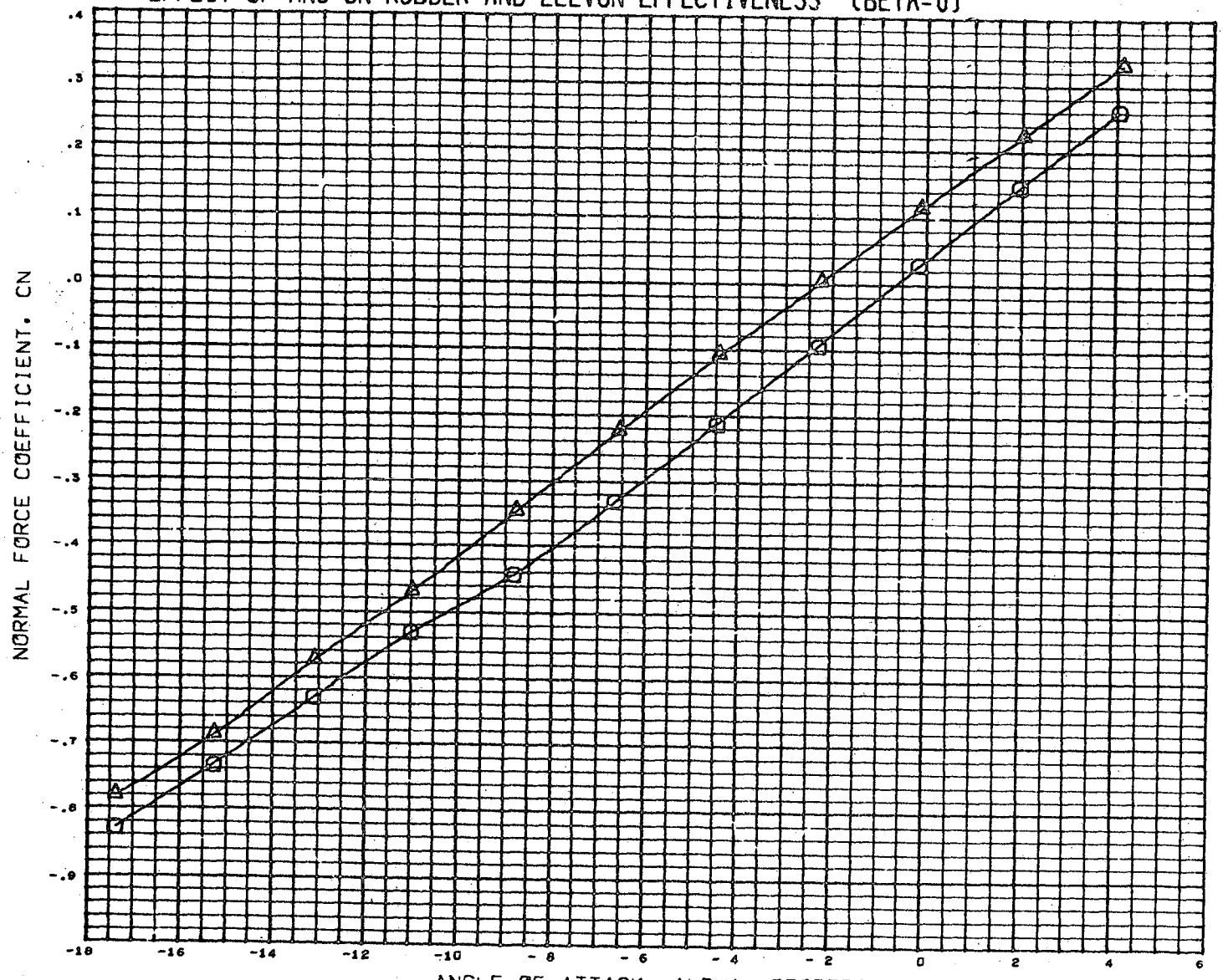
ELVATR	AILRON	RUDDER	GRIT
0.000	0.000	0.000	54.000
0.000	0.000	10.000	54.000
0.000	10.000	10.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.194

EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS (BETA=0)



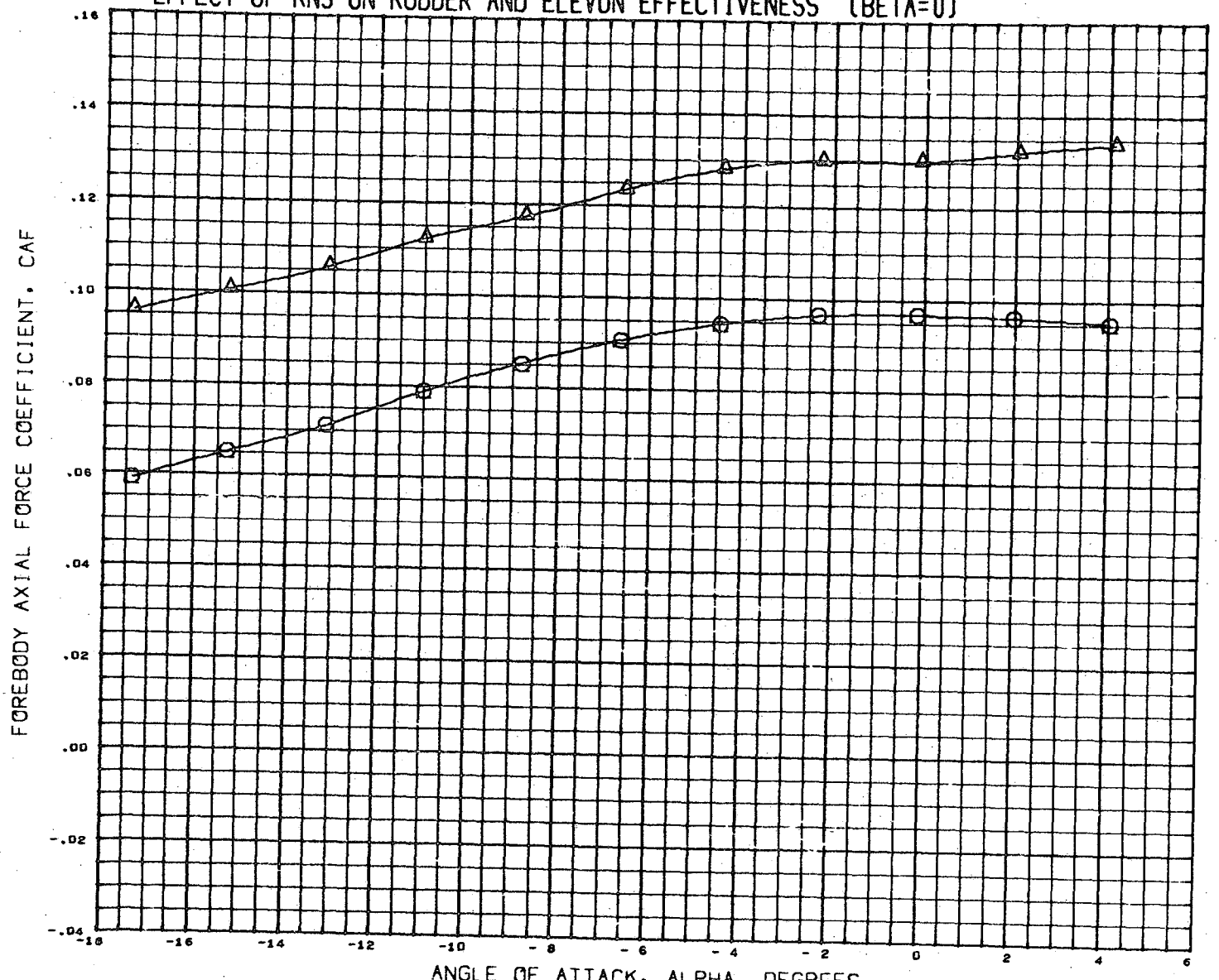
DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(A3903A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3911A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ELVATR	AILRON	RUDDER	GRIT
0.000	0.000	10.000	54.000
0.000	0.000	10.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.187

EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS (BETA=0)

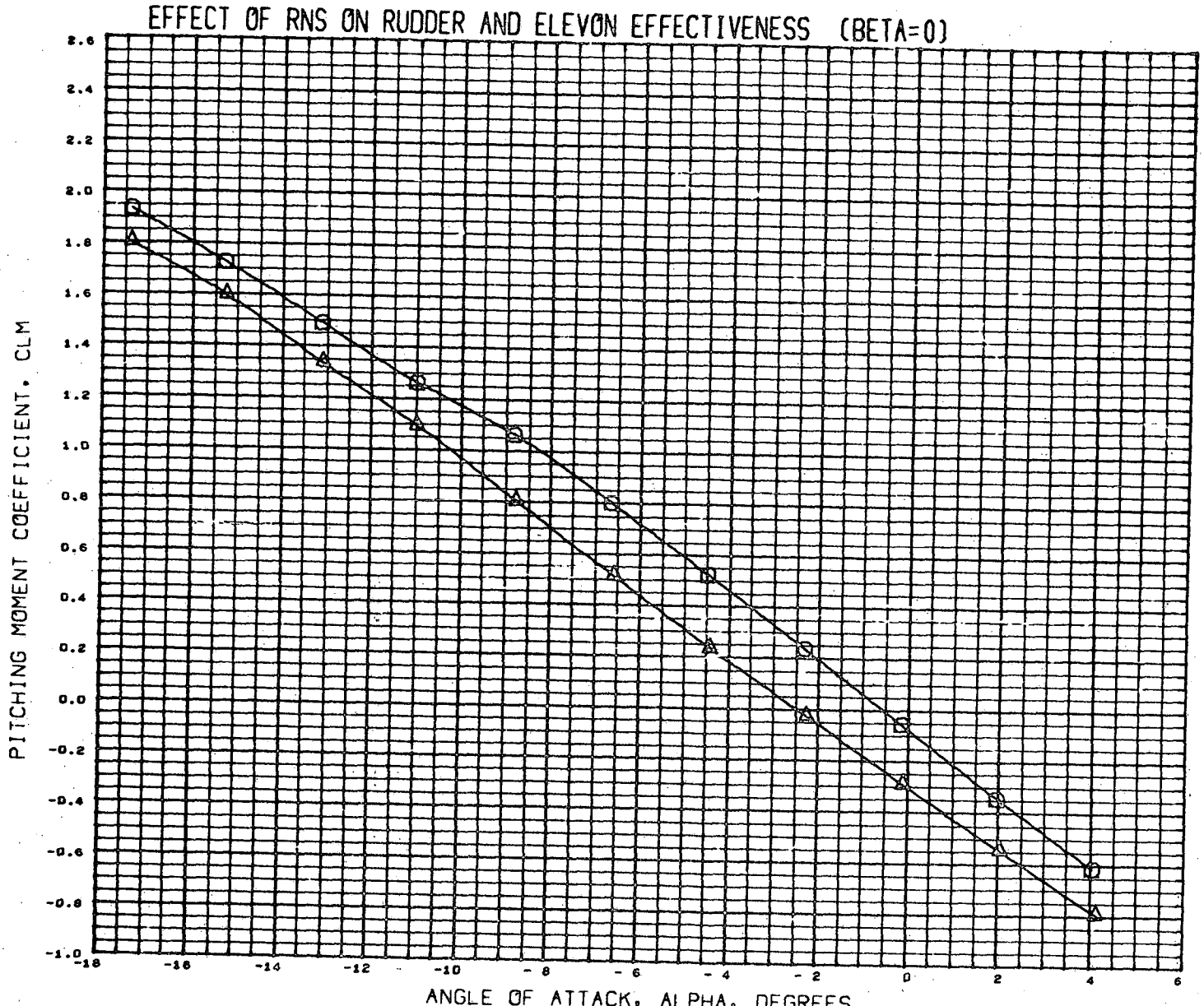


DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ELVATR	AILRON	RUDDER	GRIT
(A3903A)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	0.000	0.000	10.000	54.000
(A3911A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	0.000	10.000	54.000

MACH 1.187

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE



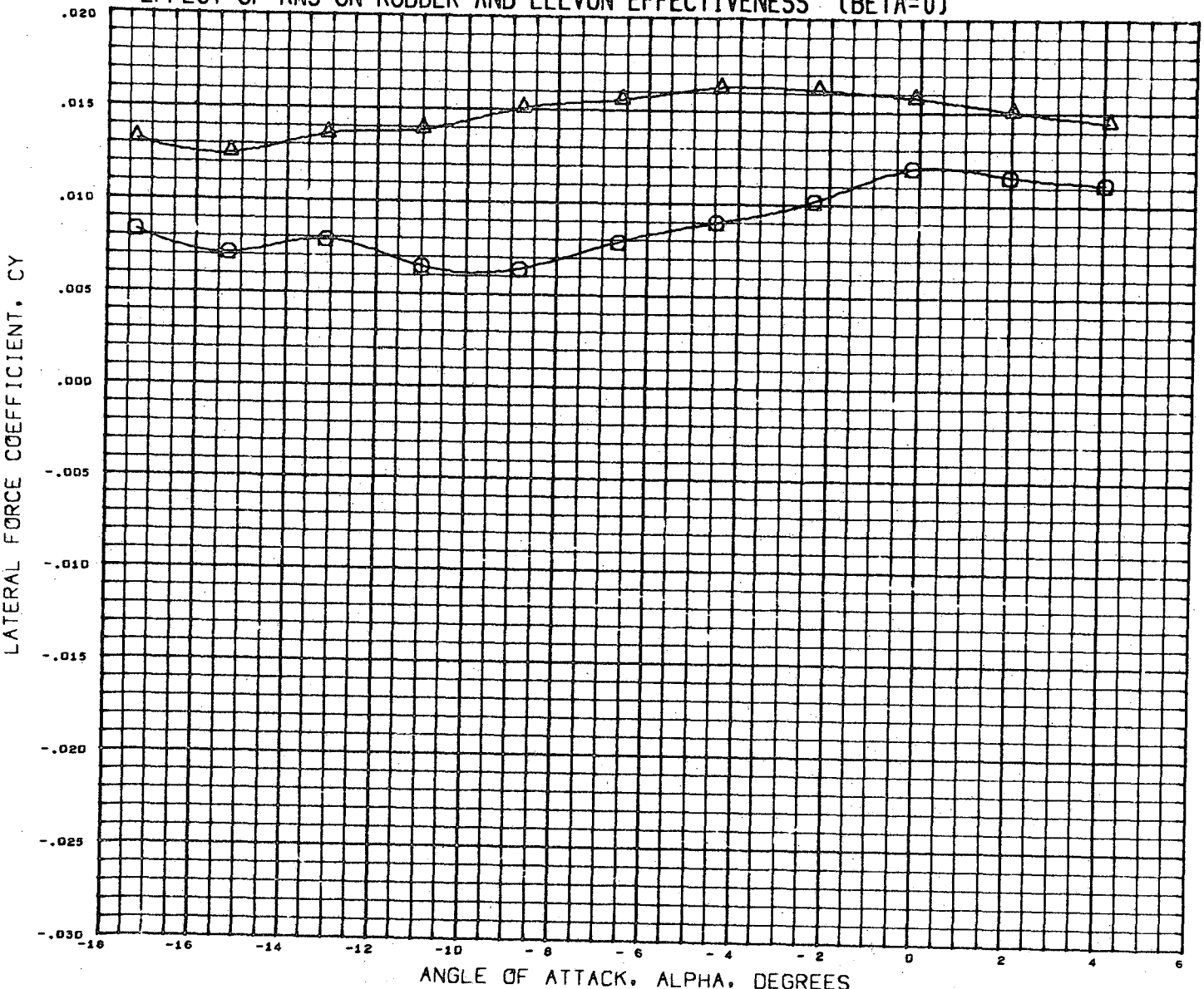
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(A3903A)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3911A)		MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ELVATR	AILRON	RUDDER	GRIT
0.000	0.000	10.000	54.000
0.000	0.000	10.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.187

EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS (BETA=0)



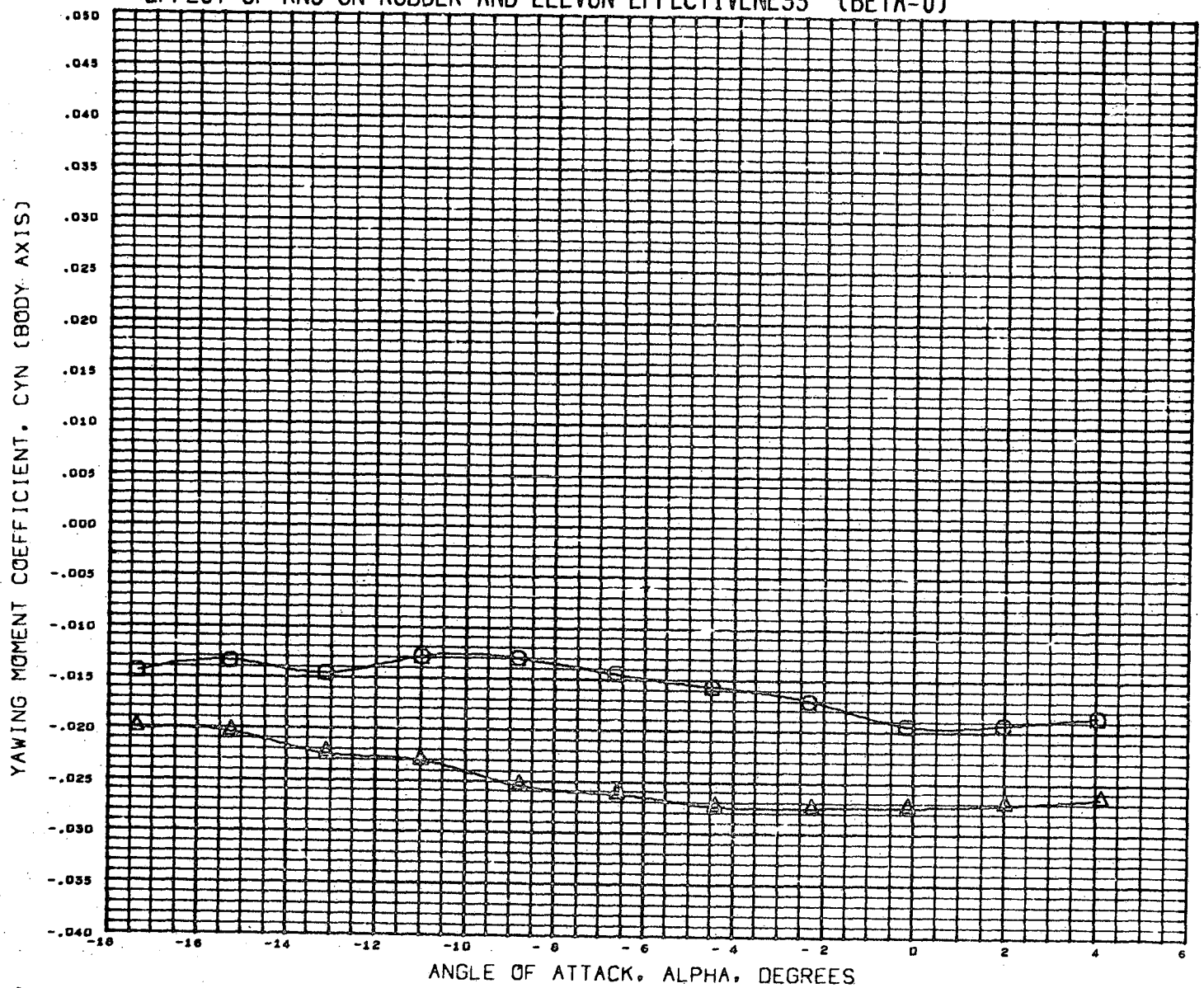
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(A3903A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3911A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

	ELVATR	AILRON	RUDDER	GRIT
	0.000	0.000	10.000	54.000
	0.000	0.000	10.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.187

EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS (BETA=0)



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(A3903A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3911A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ELVATR	AILRON	RUDDER	GRIT
0.000	0.000	10.000	54.000
0.000	0.000	10.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.187

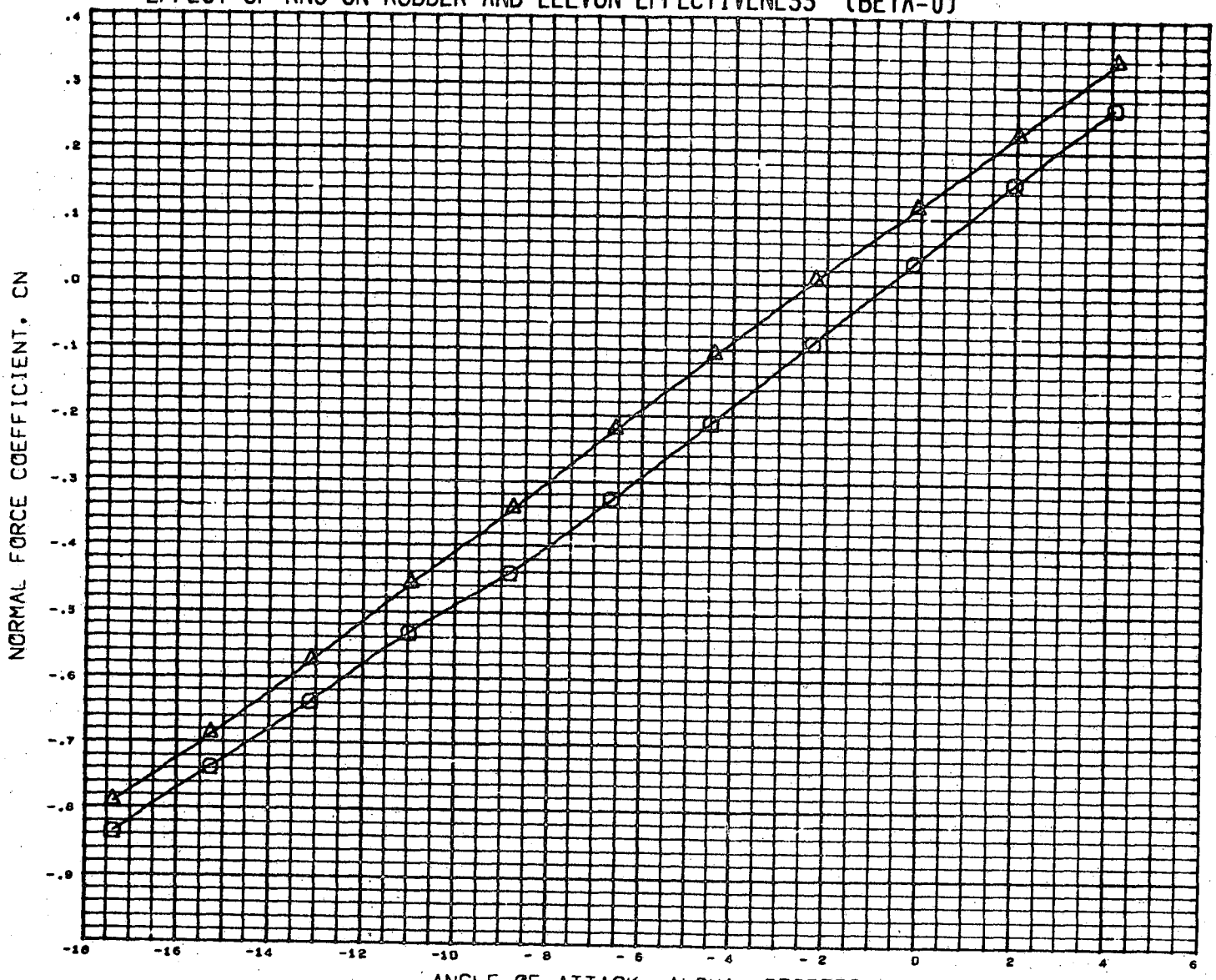
EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS (BETA=0)

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ELVATR	AILRON	RUDDER	GRIT
(A3903A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7	0.000	0.000	10.000	54.000
(A3911A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	0.000	10.000	54.000

MACH 1.187

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS (BETA=0)

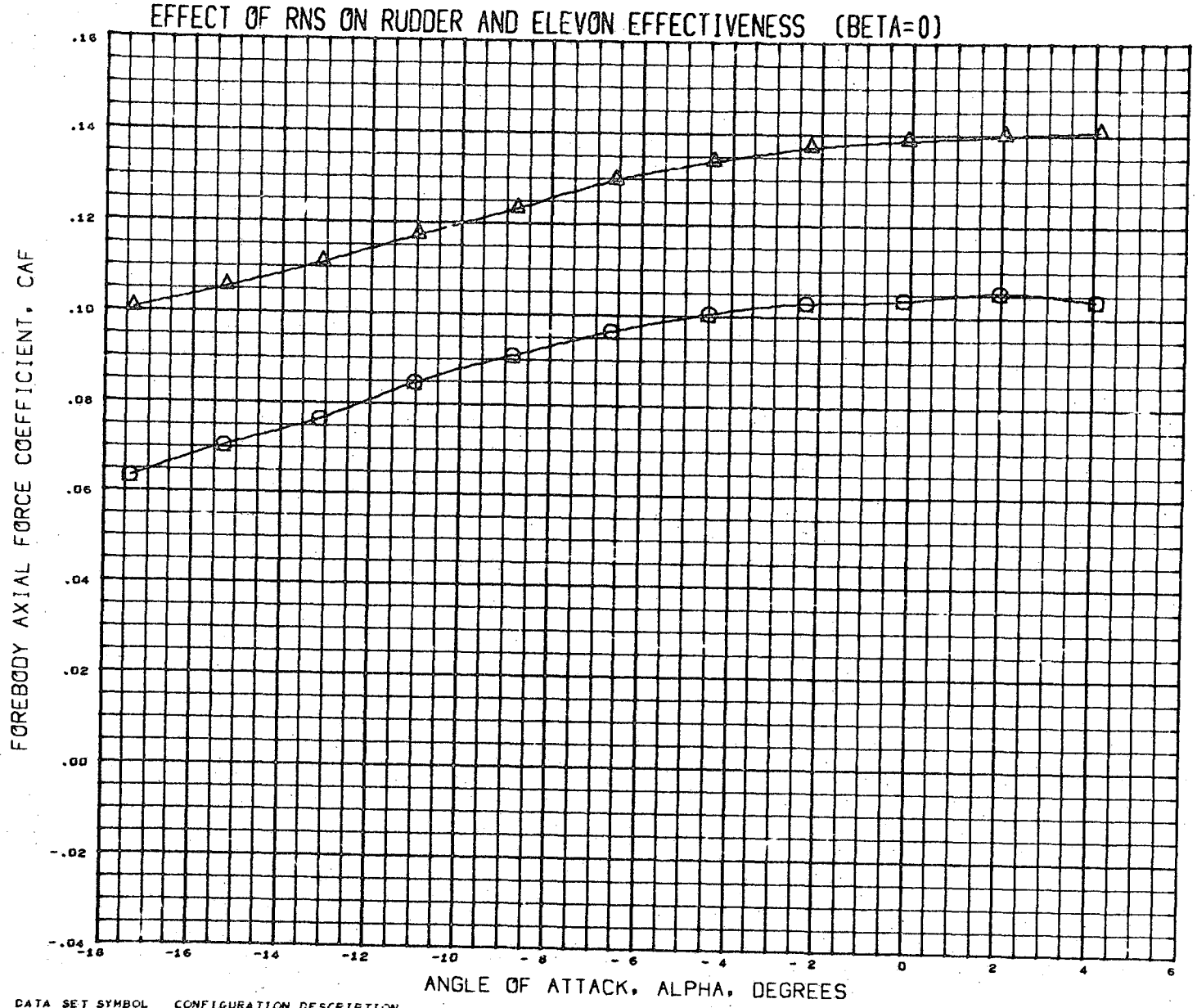


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(A3904A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3910A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ELVATR	AILRON	RUDDER	GRIT
0.000	10.000	10.000	54.000
0.000	10.000	10.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.187



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(A3904A)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3910A)		MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

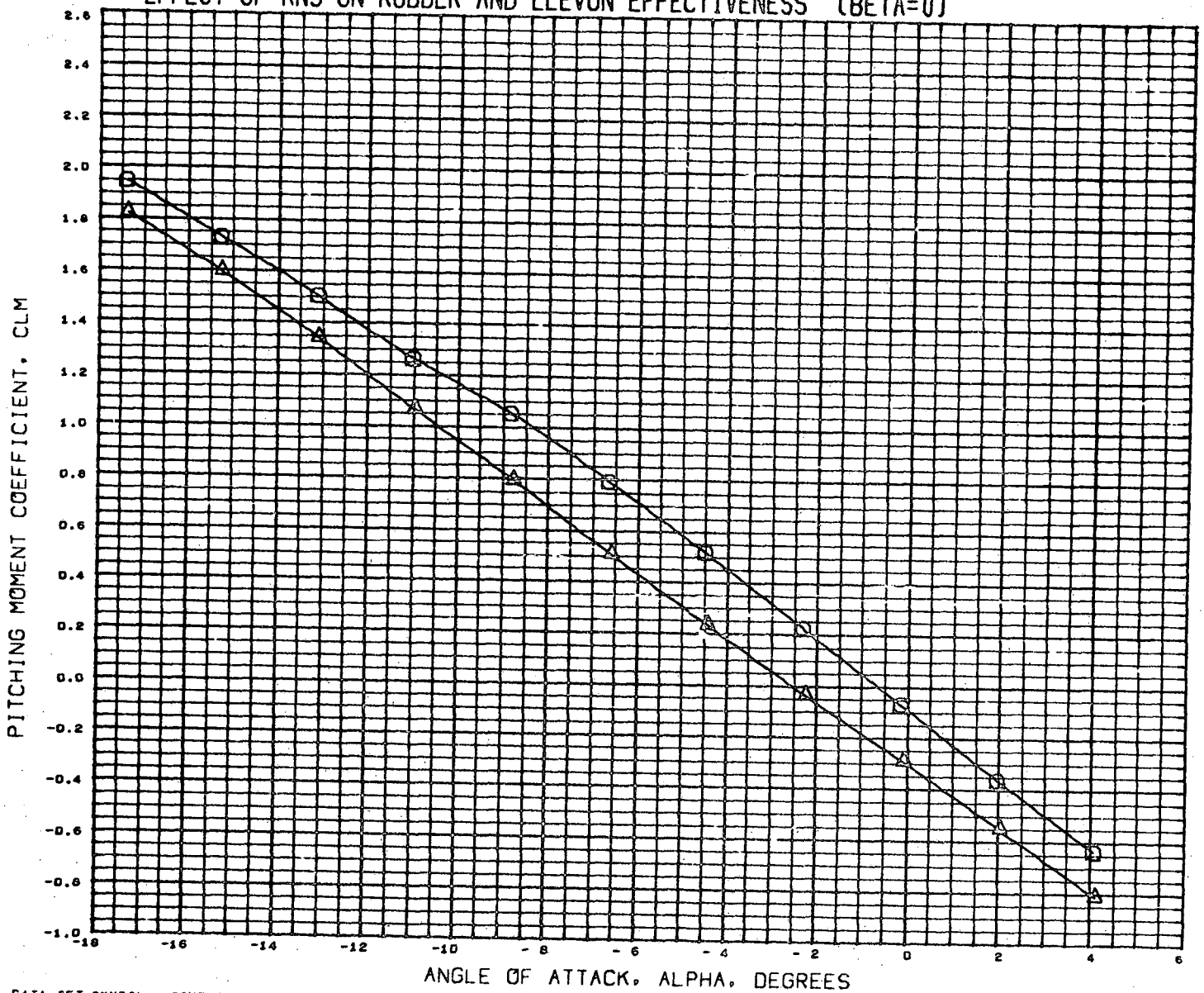
ELVATR	AILRON	RUDDER	GRIT
0.000	10.000	10.000	54.000
0.000	10.000	10.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.187

EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS (BETA=0)



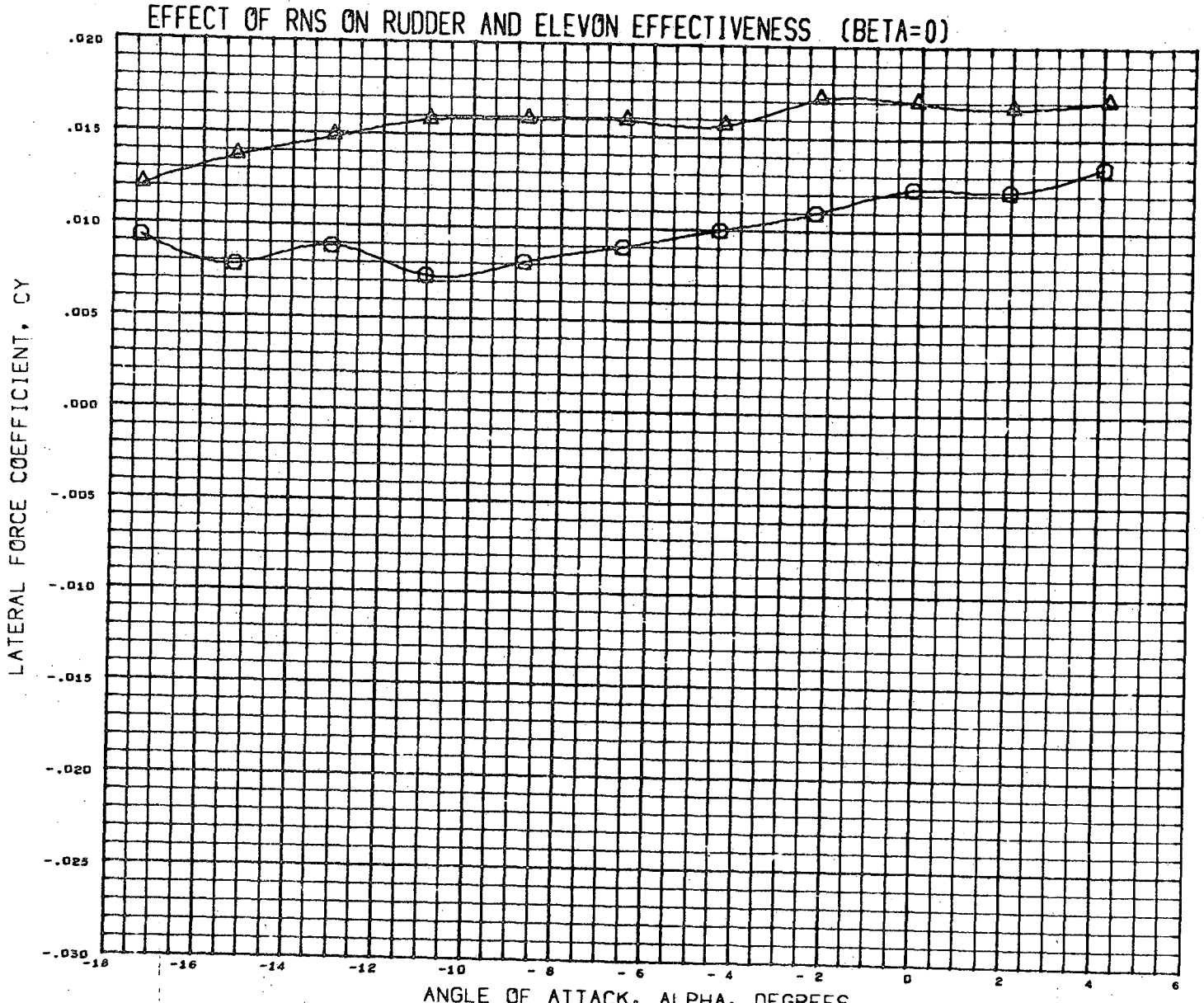
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(A3904A)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3910A)		MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

	ELVATR	AILRON	RUDDER	GRIT
	0.000	10.000	10.000	54.000
	0.000	10.000	10.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.187



DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(A3904A)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3910A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

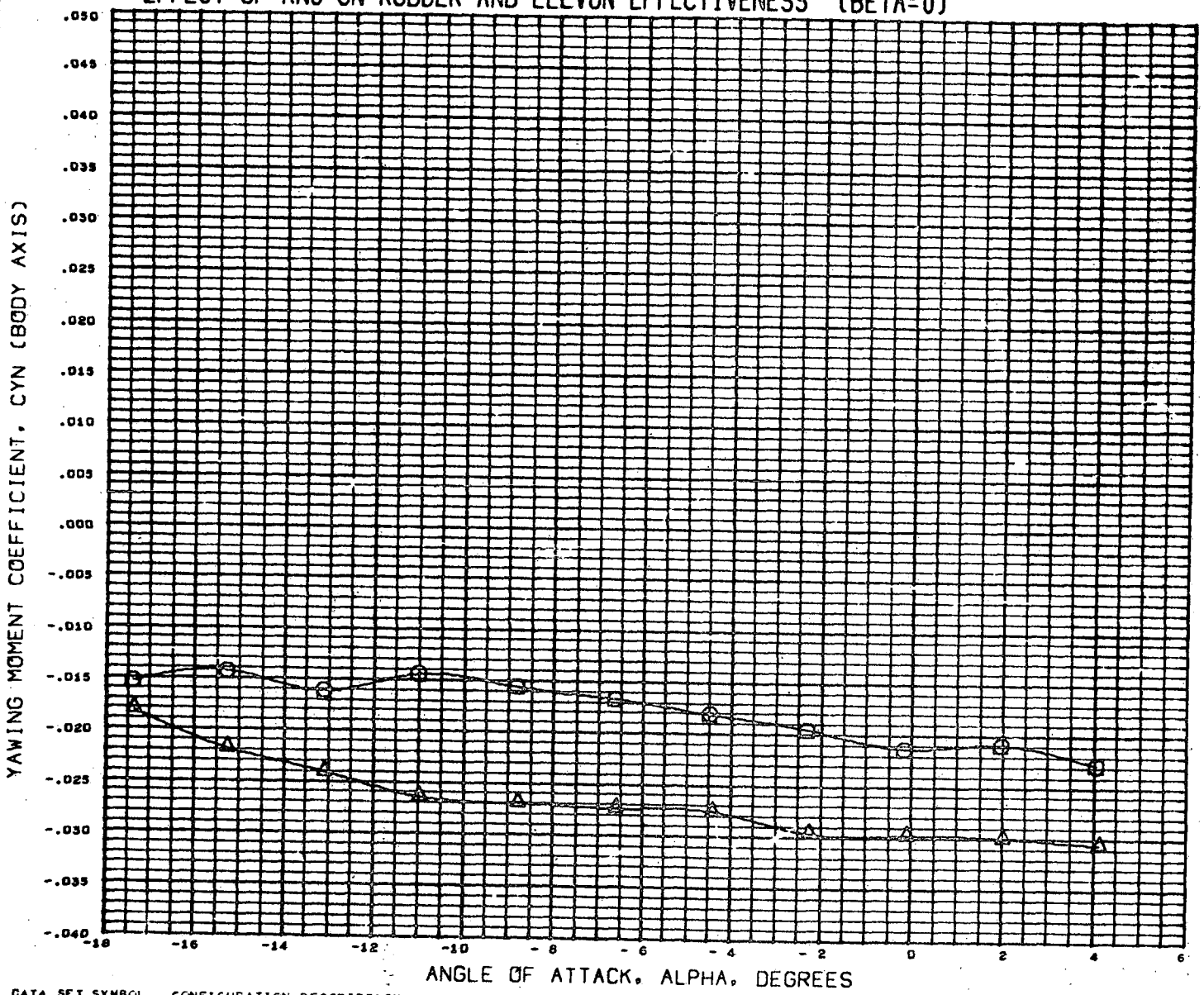
	ELVATR	AILRON	RUDDER	GRIT
	0.000	10.000	10.000	54.000
	0.000	10.000	10.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.187

EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS (BETA=0)



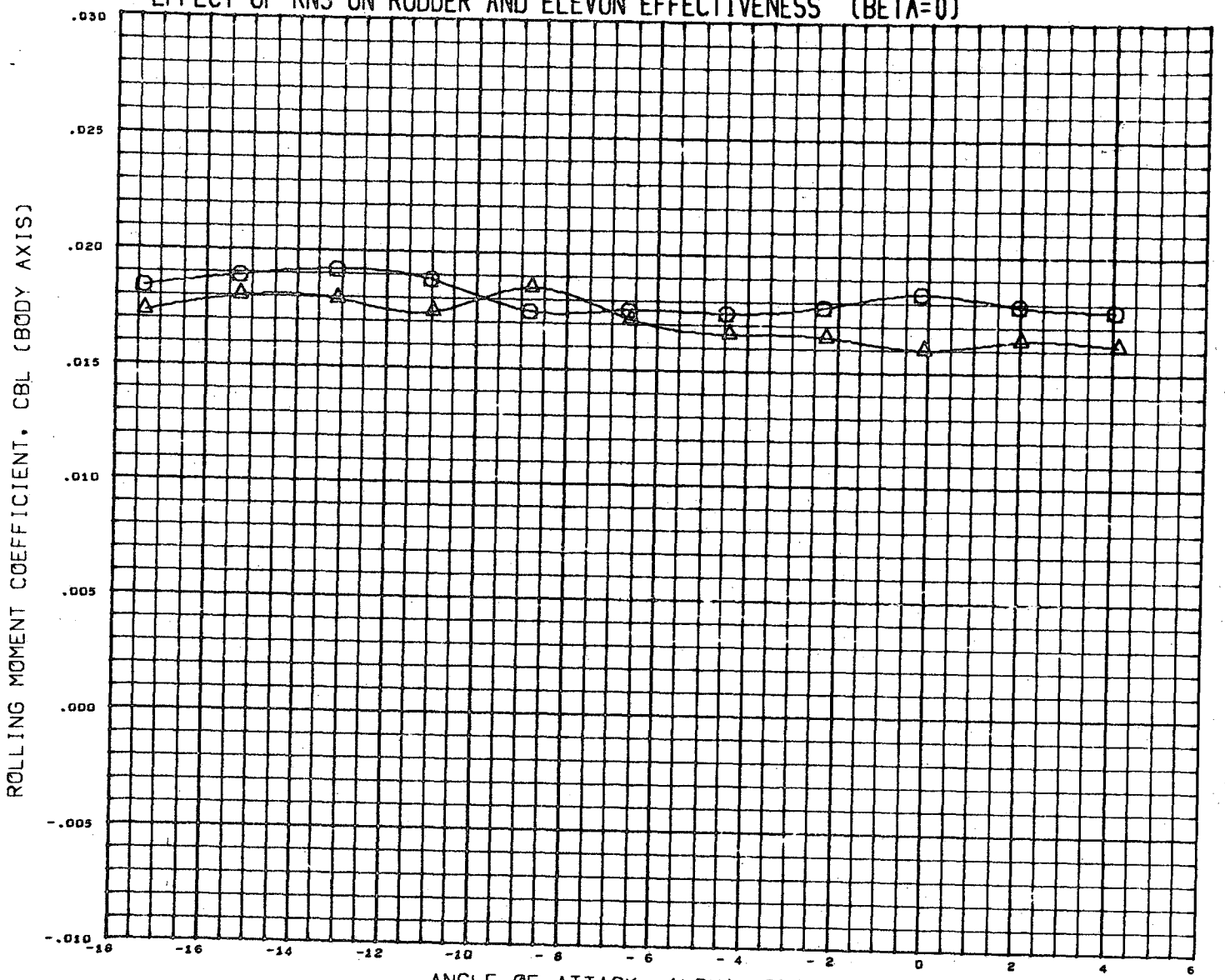
DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(A3904A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3910A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ELVATR	AILRON	RUDDER	GRIT
0.000	10.000	10.000	54.000
0.000	10.000	10.000	54.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.187

EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS (BETA=0)



DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(A39D4A)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3910A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

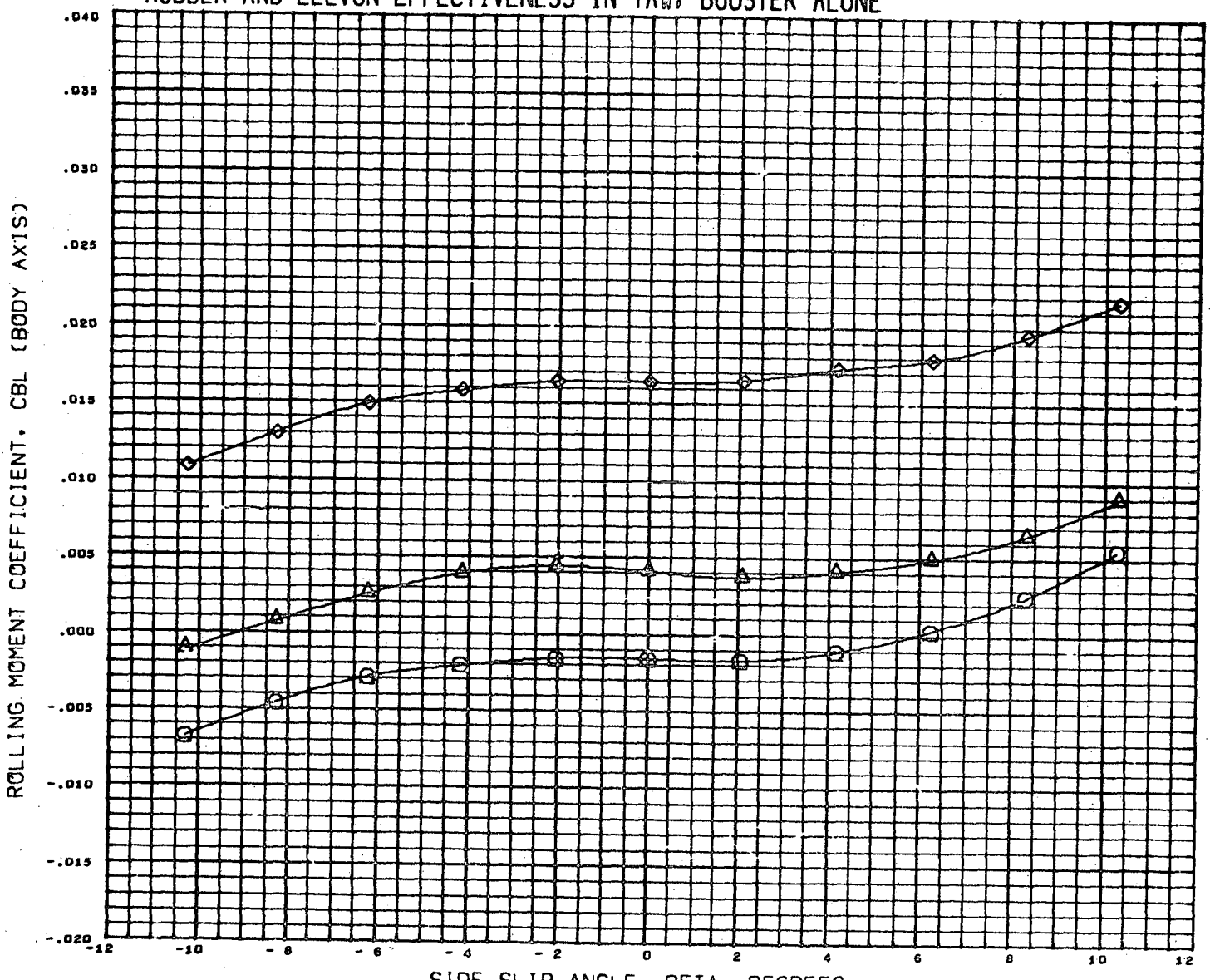
ELVATR	AILRON	RUDDER	GRIT
0.000	10.000	10.000	54.000
0.000	10.000	10.000	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.187

RUDDER AND ELEVON EFFECTIVENESS IN YAW, BOOSTER ALONE



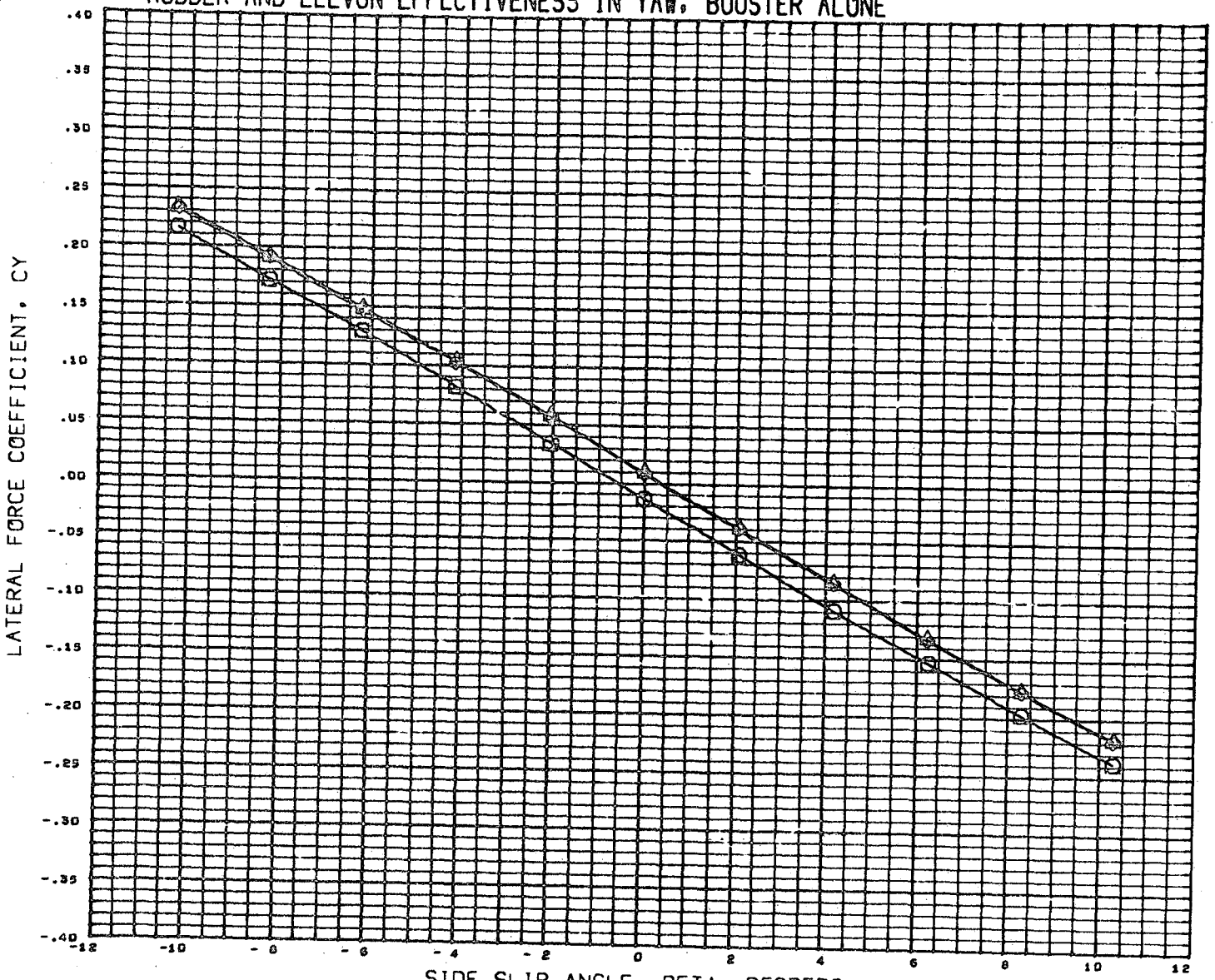
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(D3901B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3903B)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(A3904B)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	0.000
-6.000	0.000	0.000	10.000
-6.000	0.000	10.000	10.000

REFERENCE INFORMATION		
SREF	15.8560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.193

RUDDER AND ELEVON EFFECTIVENESS IN YAW, BOOSTER ALONE



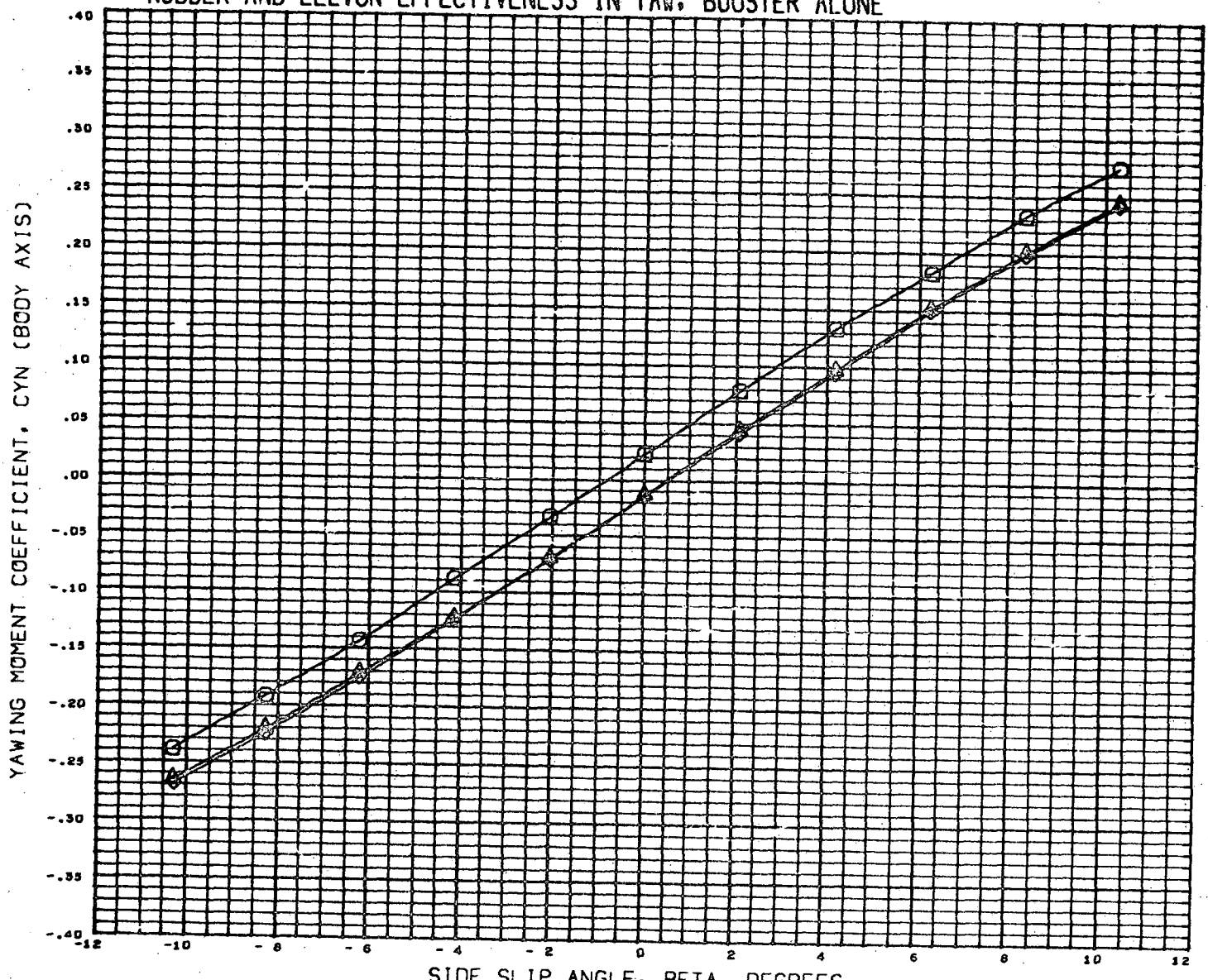
DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(E39028)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C39038)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C39048)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	0.000
-6.000	0.000	0.000	10.000
-6.000	0.000	10.000	10.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.202

RUDDER AND ELEVON EFFECTIVENESS IN YAW, BOOSTER ALONE



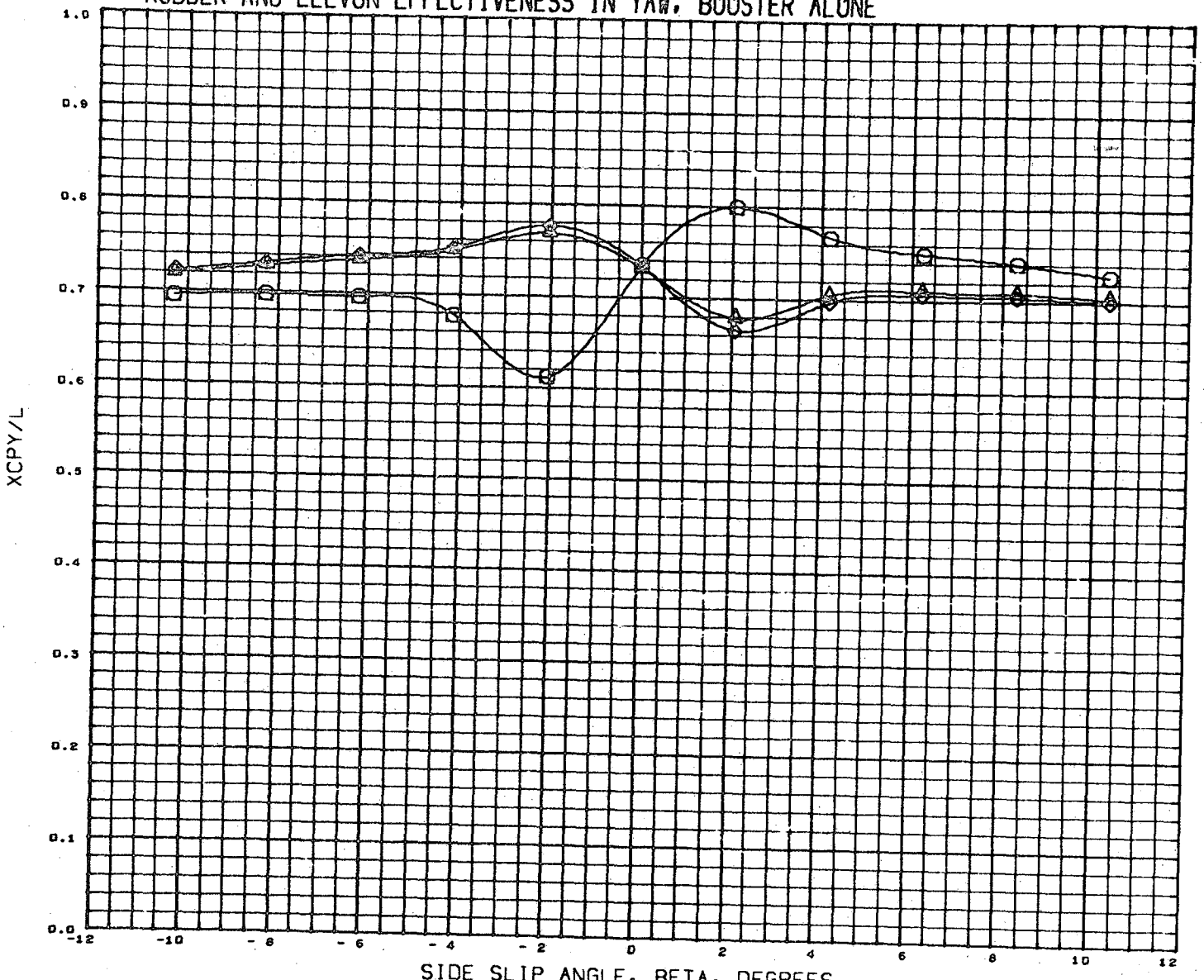
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(E3902B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3903B)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3904B)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	0.000
-6.000	0.000	0.000	10.000
-6.000	0.000	10.000	10.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRF	0.0000	
YMRF	0.0000	
ZMRF	0.0000	
SCALE	0.0031	SCALE

MACH 1.202

RUDDER AND ELEVON EFFECTIVENESS IN YAW, BOOSTER ALONE



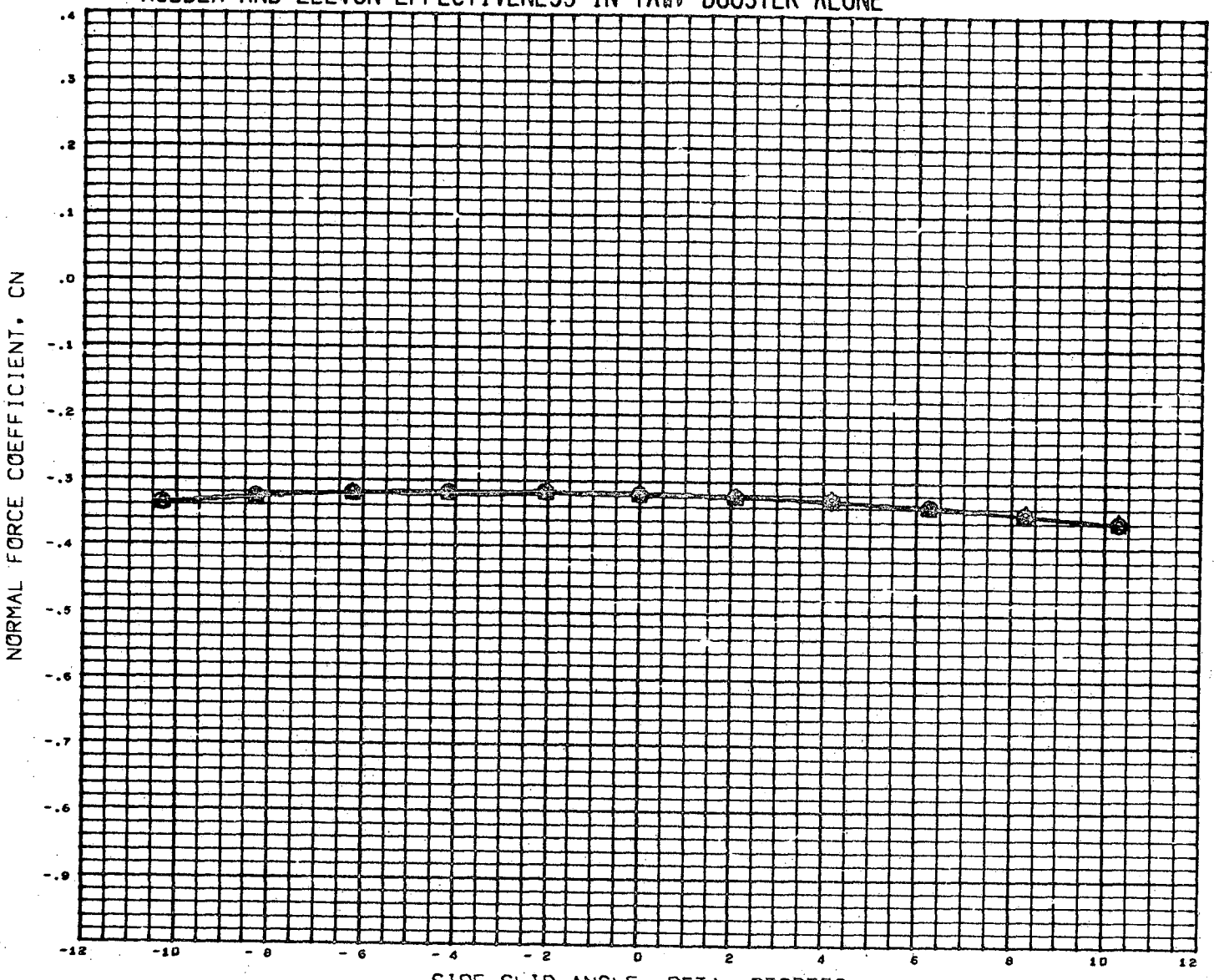
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(E3902B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3903B)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3904B)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	0.000
-6.000	0.000	0.000	10.000
-6.000	0.000	10.000	10.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.202

RUDDER AND ELEVON EFFECTIVENESS IN YAW, BOOSTER ALONE



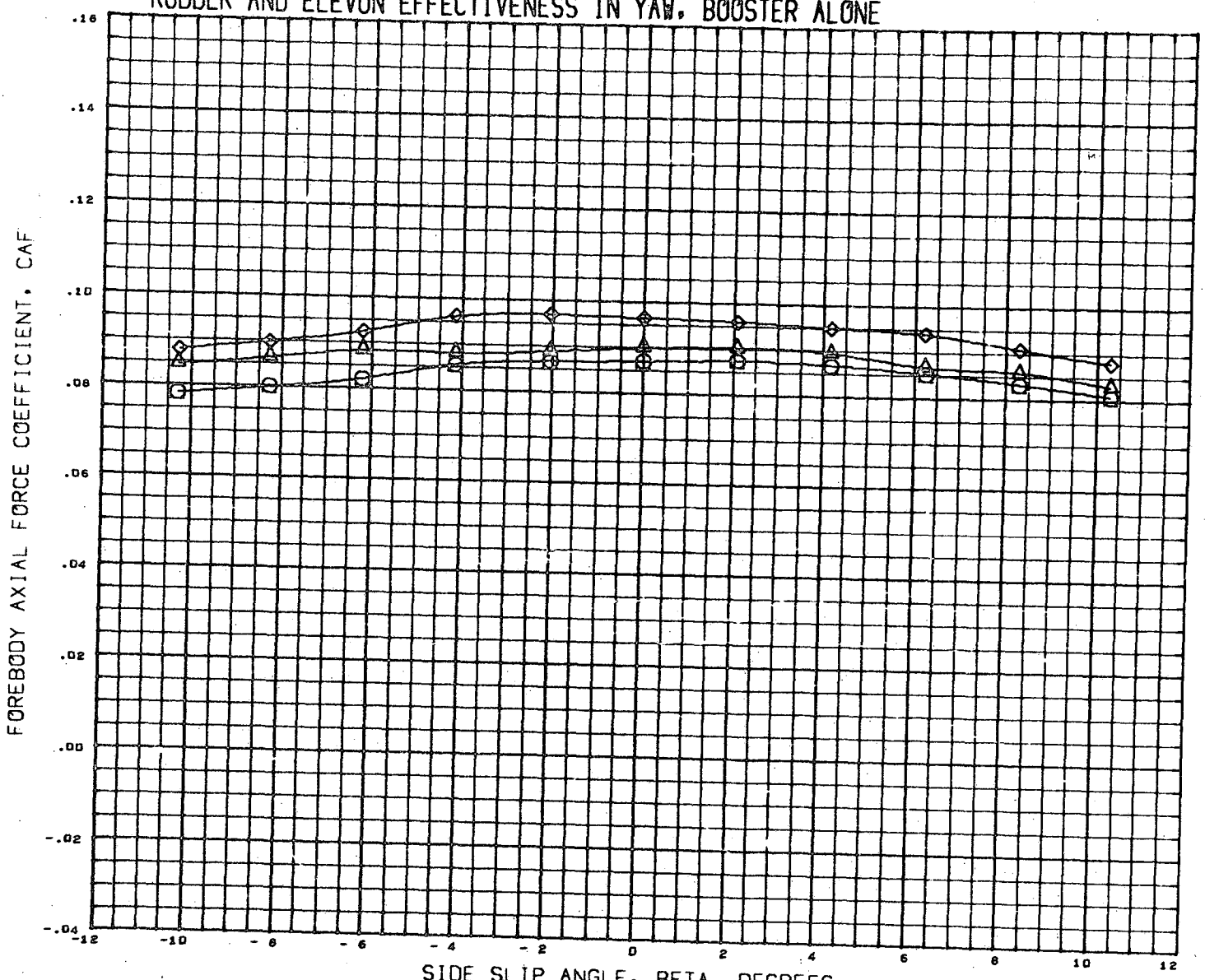
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(E3902B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3903B)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3904B)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	0.000
-6.000	0.000	0.000	10.000
-6.000	0.000	10.000	10.000

MACH 1.202

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

RUDDER AND ELEVON EFFECTIVENESS IN YAW, BOOSTER ALONE



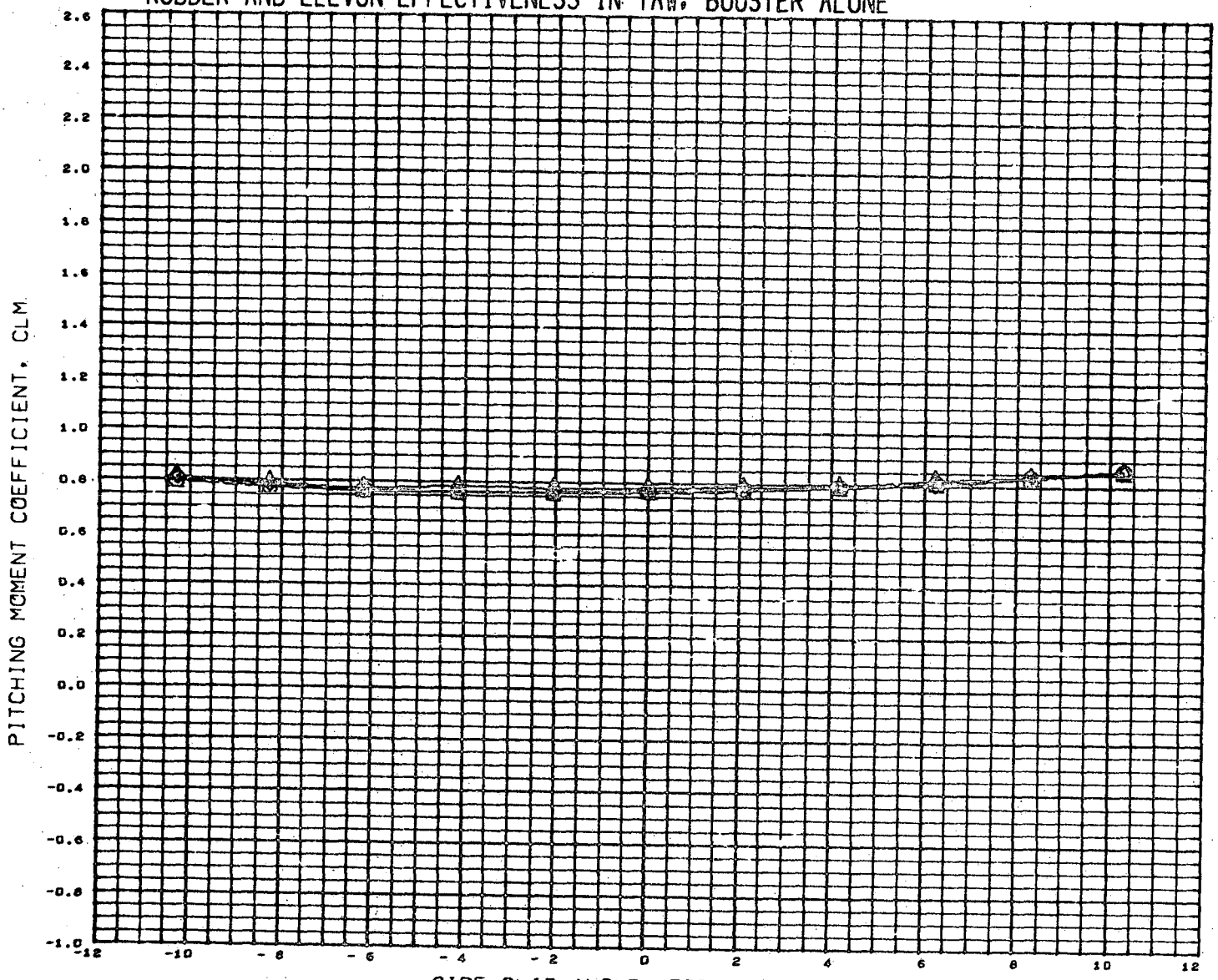
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(E3902B) ○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3903B) △	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3904B) ◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	0.000
-6.000	0.000	0.000	10.000
-6.000	0.000	10.000	10.000

MACH 1.202

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

RUDDER AND ELEVON EFFECTIVENESS IN YAW, BOOSTER ALONE



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(E3902B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3903B)	△	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3904B)	◇	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

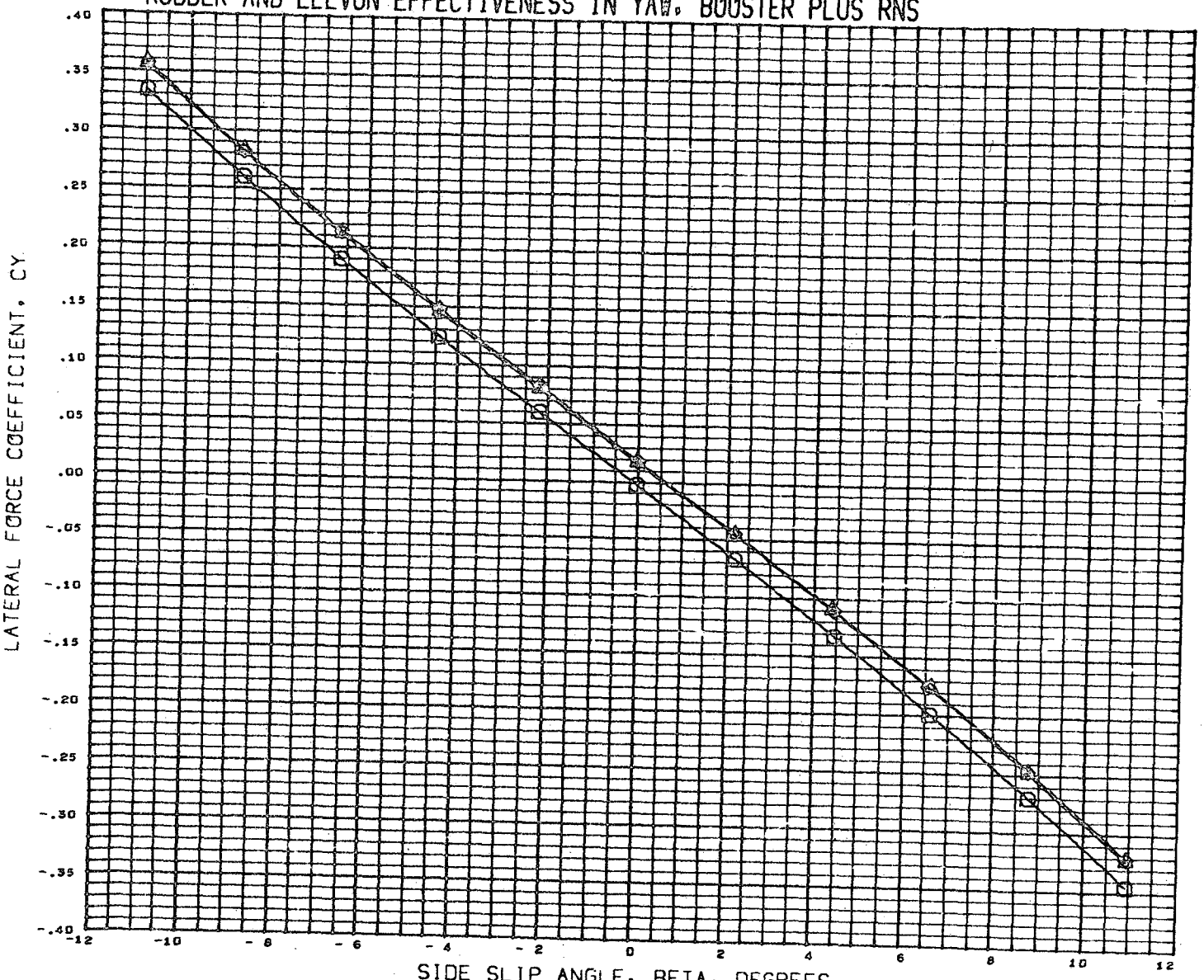
ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	0.000
-6.000	0.000	0.000	10.000
-6.000	0.000	10.000	10.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.202

RUDDER AND ELEVON EFFECTIVENESS IN YAW, BOOSTER PLUS RNS



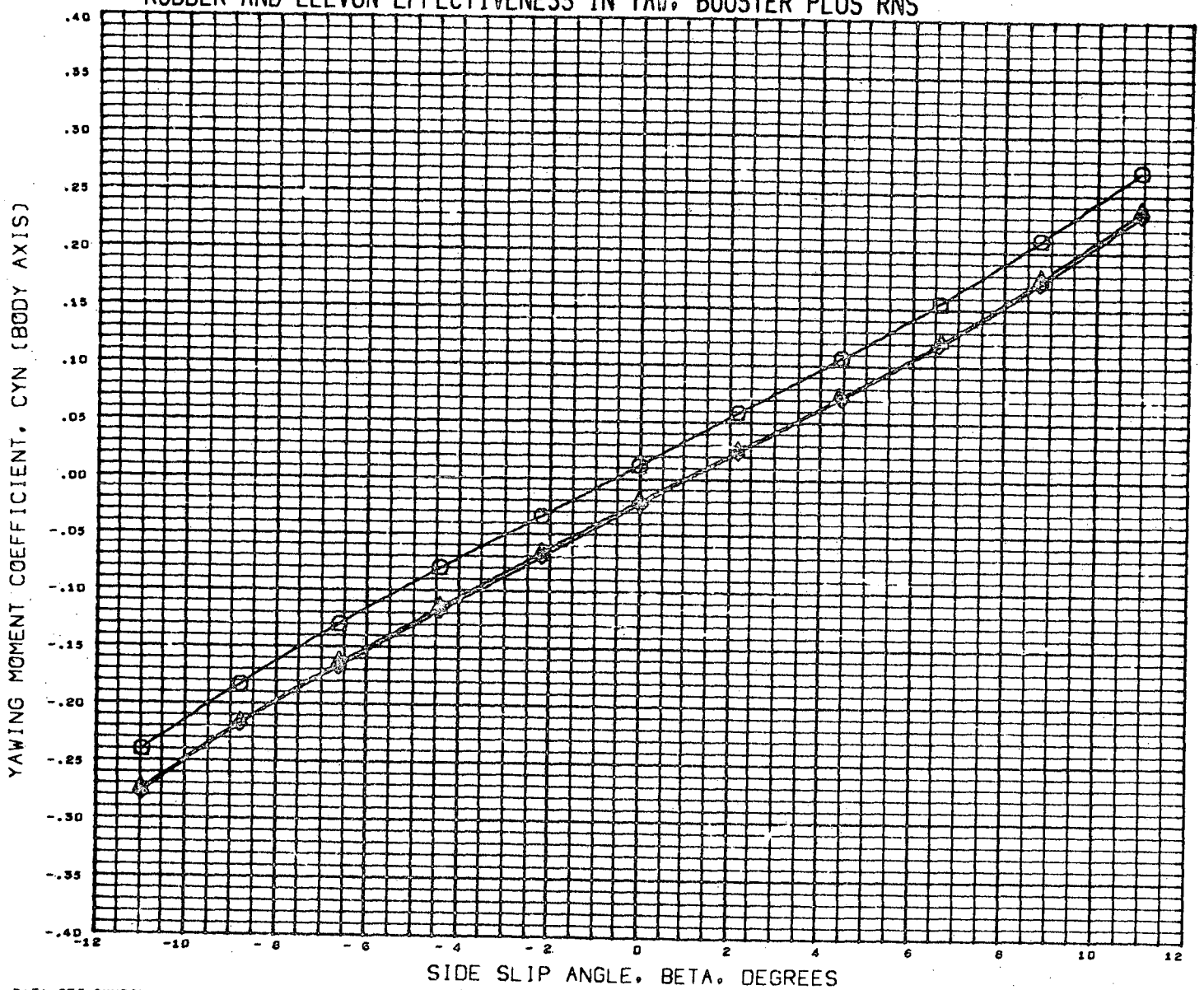
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3907B)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3911B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3910B)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	0.000
-6.000	0.000	0.000	10.000
-6.000	0.000	10.000	10.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.199

RUDDER AND ELEVON EFFECTIVENESS IN YAW, BOOSTER PLUS RNS

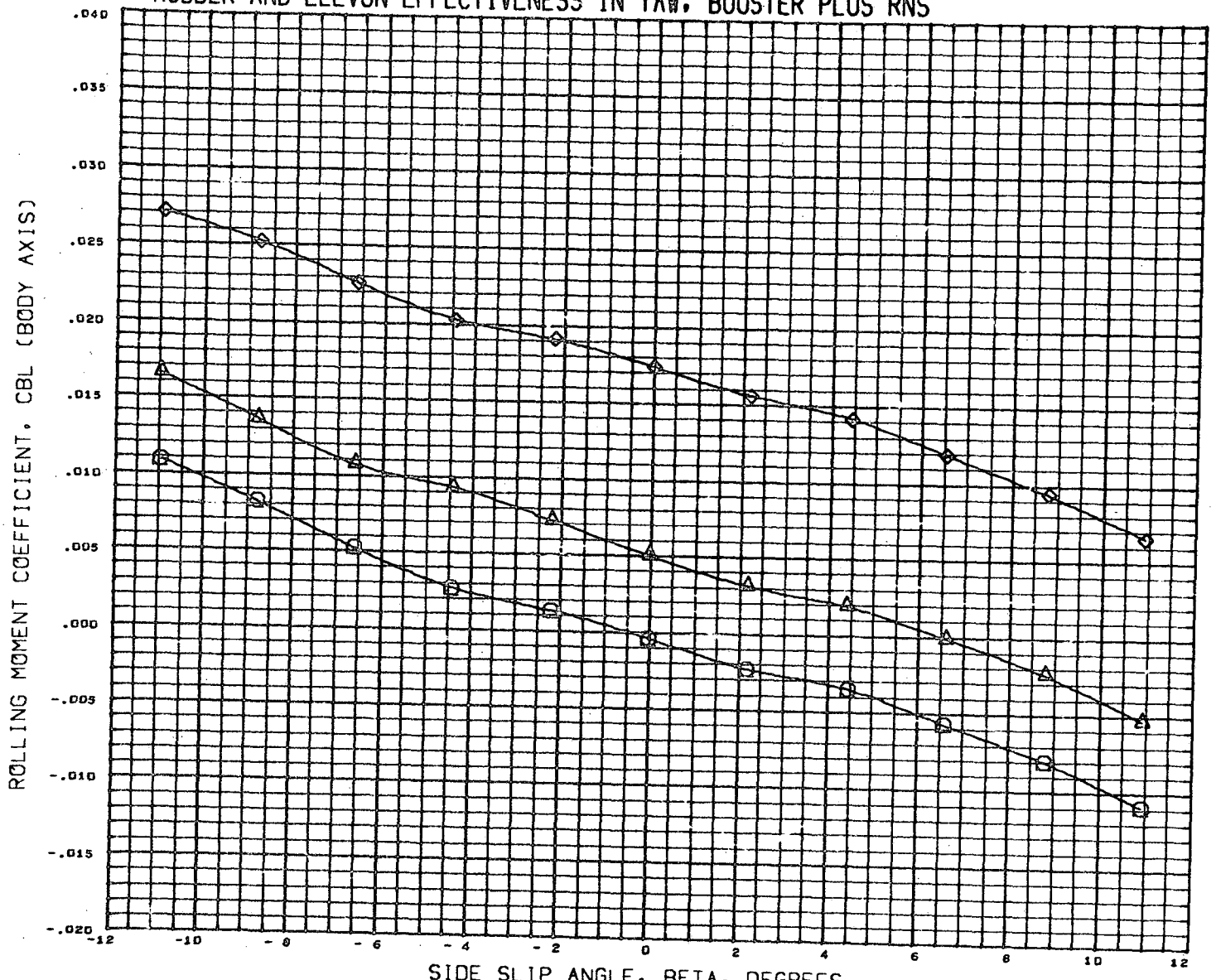


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	ELVATR	AILRON	RUDDER
(C3907B)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	-6.000	0.000	0.000	0.000
(C3911B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	-6.000	0.000	0.000	10.000
(C3910B)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	-6.000	0.000	10.000	10.000

MACH 1.199

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

RUDDER AND ELEVON EFFECTIVENESS IN YAW, BOOSTER PLUS RNS



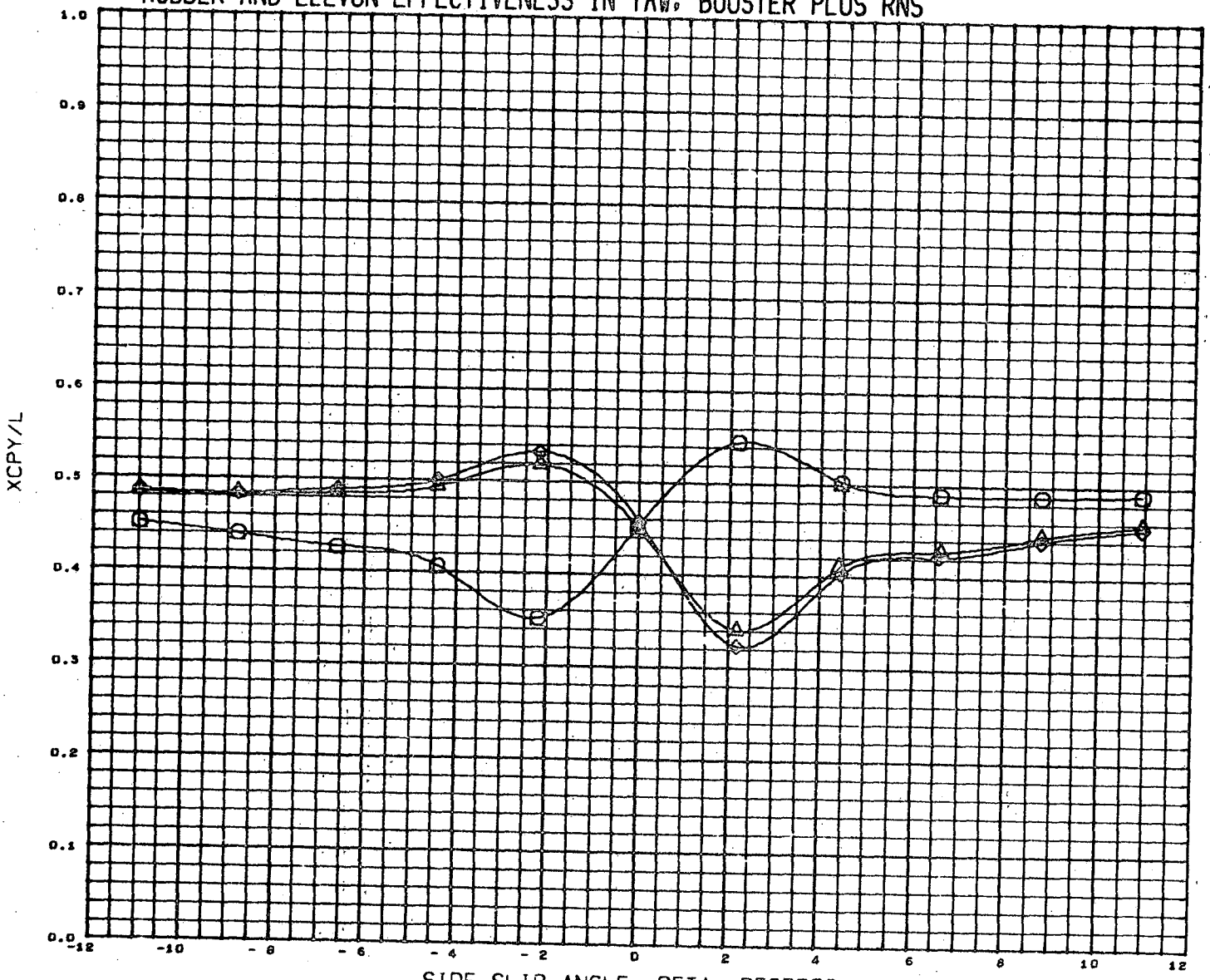
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(D3907B)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3911B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3910B)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	0.000
-6.000	0.000	0.000	10.000
-6.000	0.000	10.000	10.000

MACH 1.199

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

RUDDER AND ELEVON EFFECTIVENESS IN YAW, BOOSTER PLUS RNS



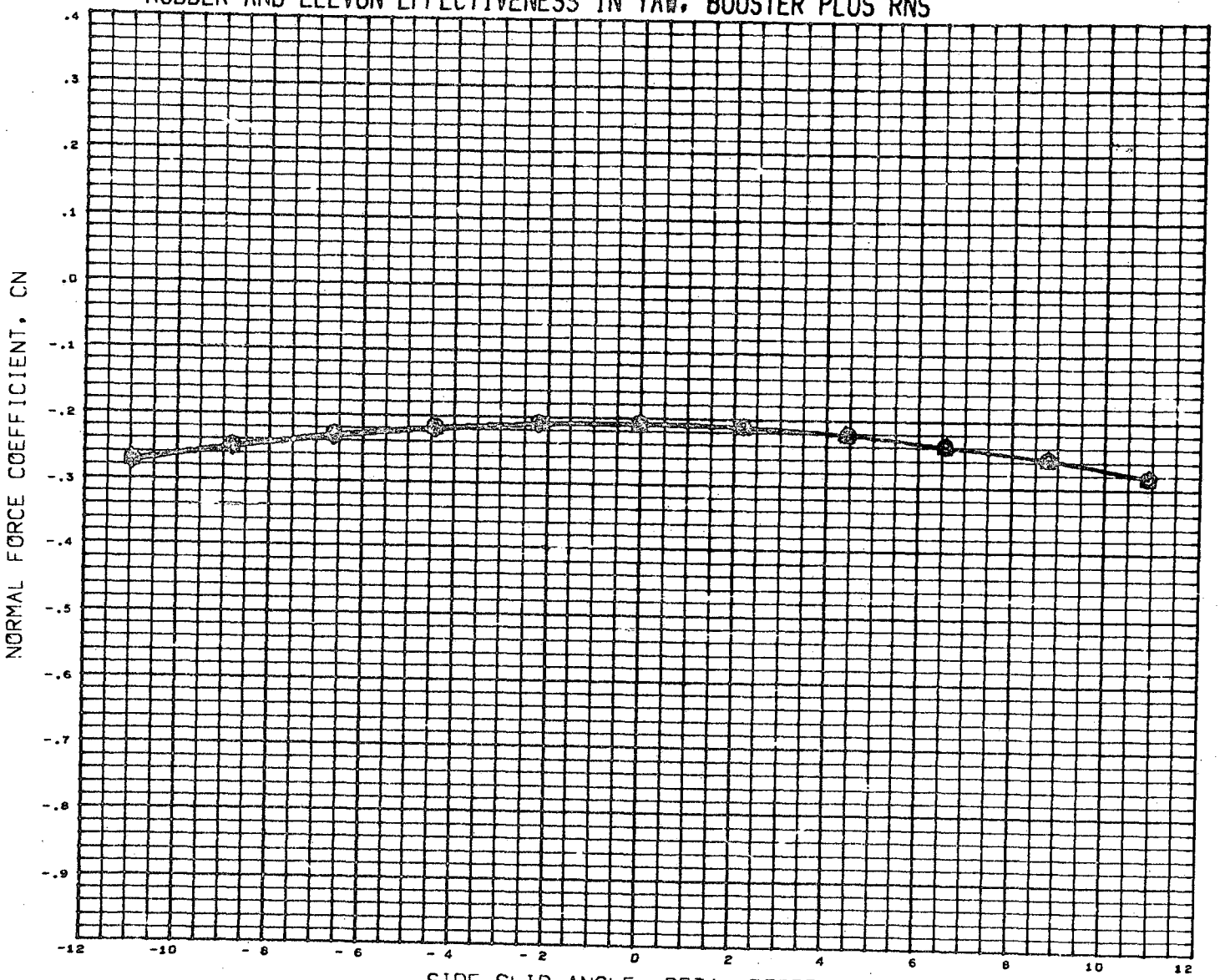
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(D3907B)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3911B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3910B)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	0.000
-6.000	0.000	0.000	10.000
-6.000	0.000	10.000	10.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.199

RUDDER AND ELEVON EFFECTIVENESS IN YAW, BOOSTER PLUS RNS



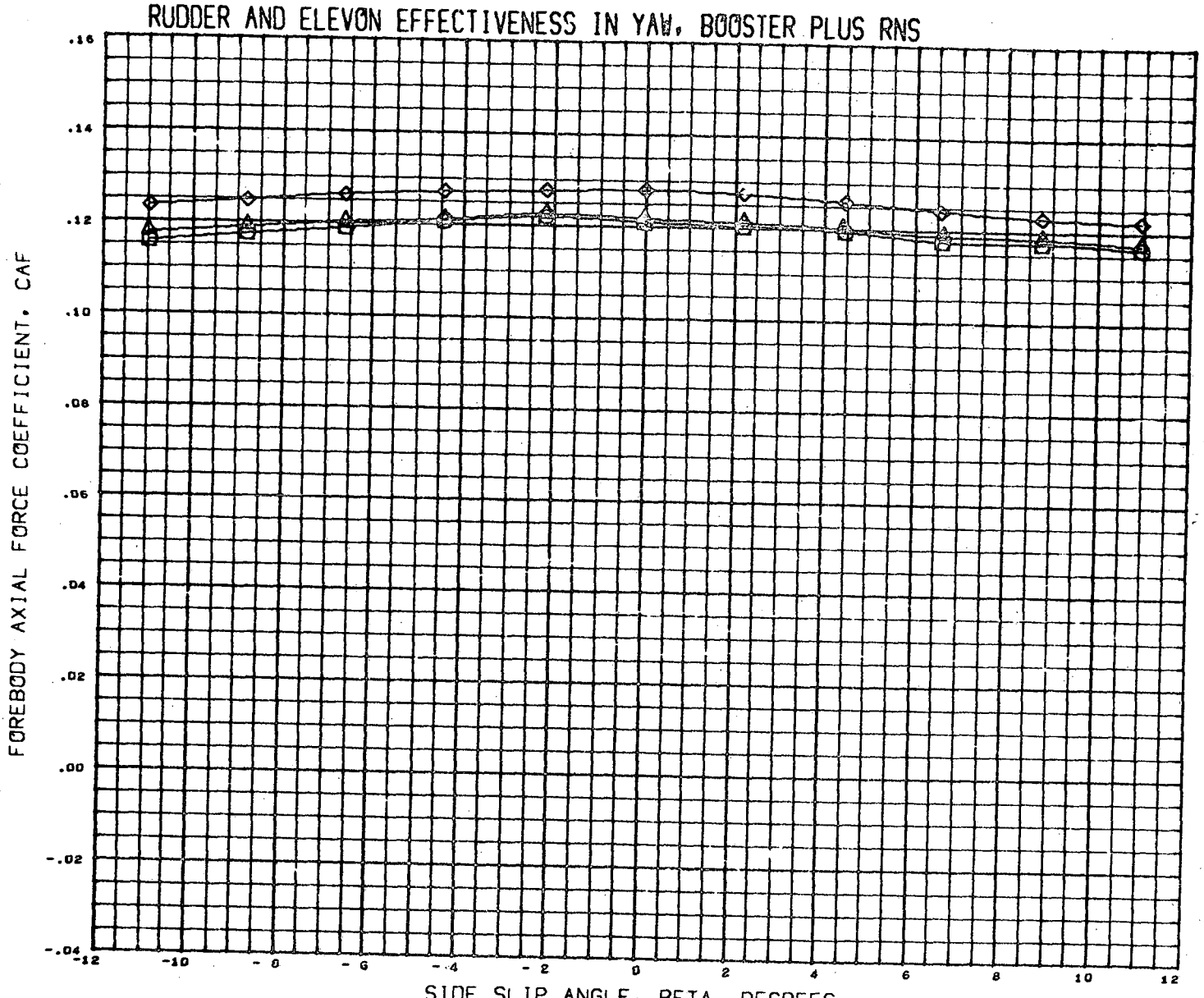
DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(C3907B)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3911B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3916B)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

MACH 1.199

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	0.000
-6.000	0.000	0.000	10.000
-6.000	0.000	10.000	10.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE



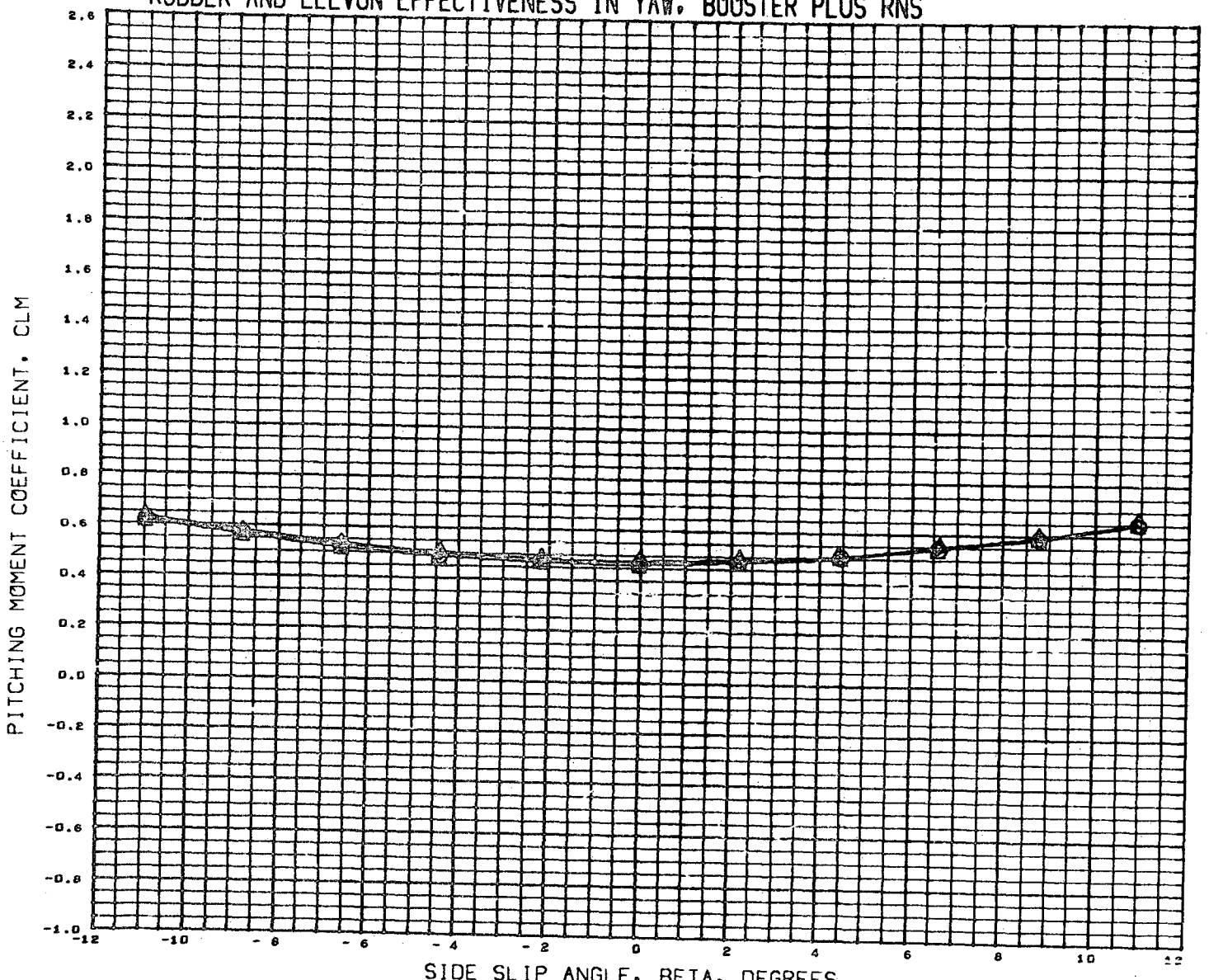
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(D3907B)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3911B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3910B)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	0.000
-6.000	0.000	0.000	10.000
-6.000	0.000	10.000	10.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.199

RUDDER AND ELEVON EFFECTIVENESS IN YAW, BOOSTER PLUS RNS



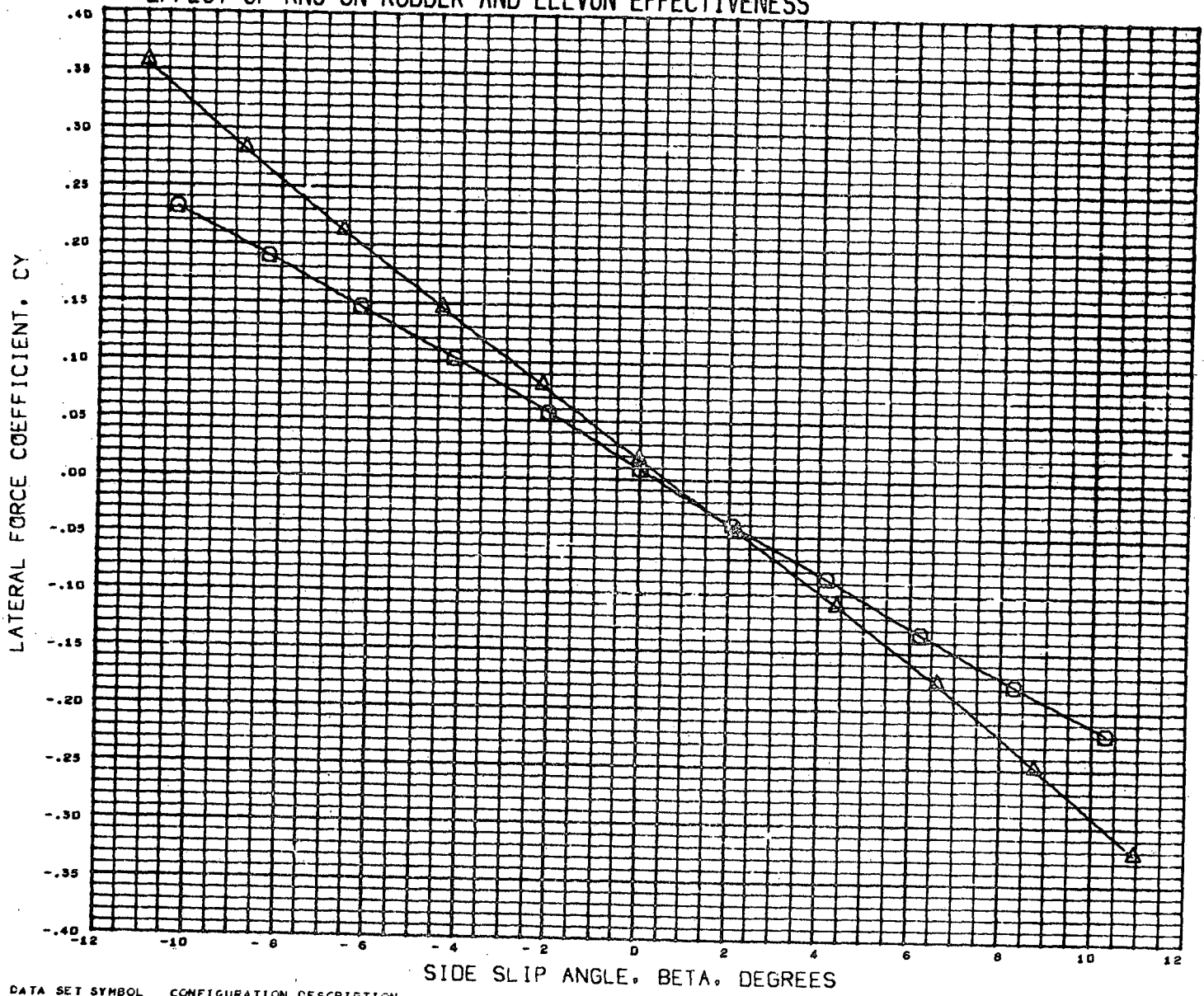
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(D3907B)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3911B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS
(C3910B)	◇	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	0.000
-6.000	0.000	0.000	10.000
-6.000	0.000	10.000	10.000

MACH 1.199

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS



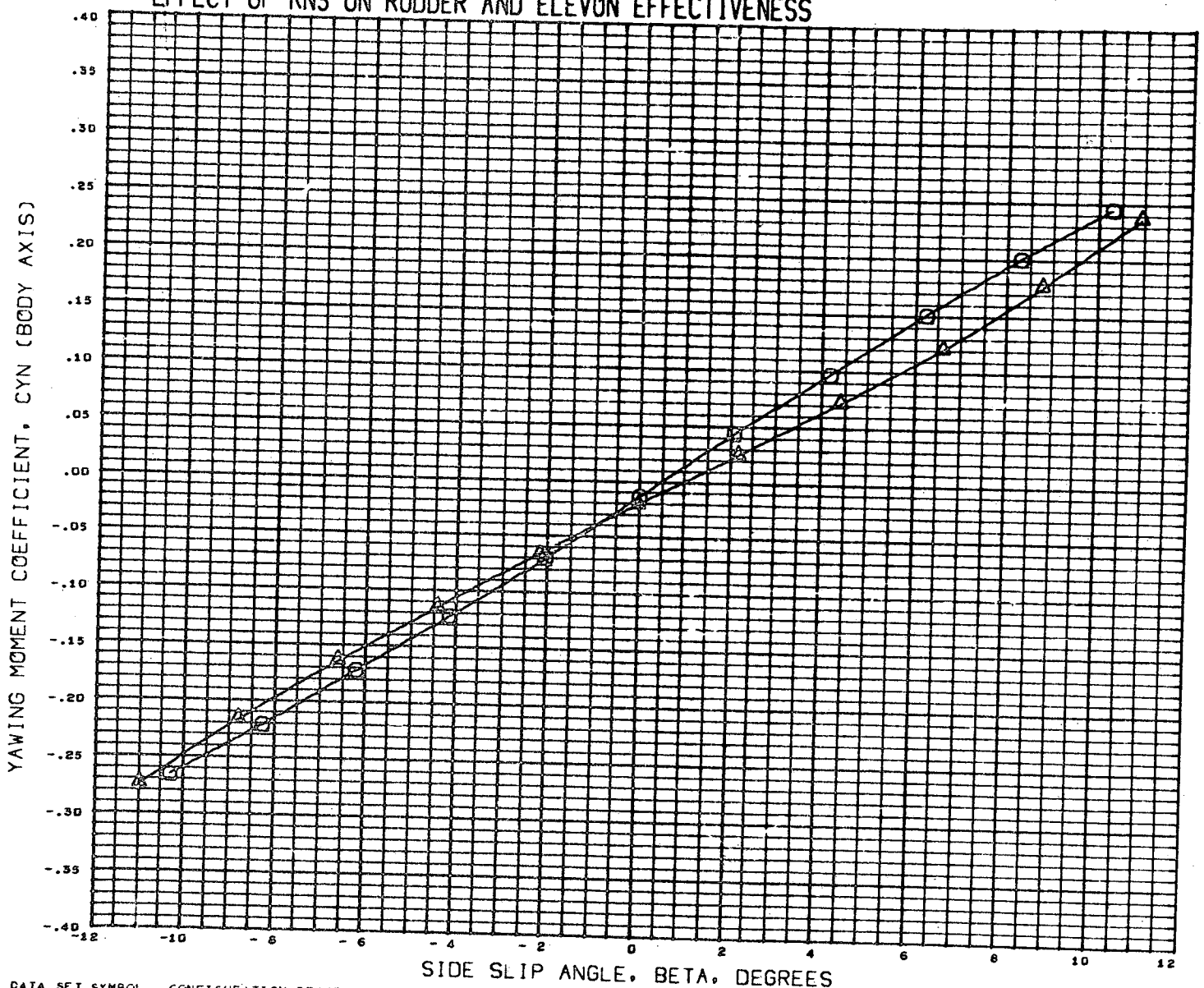
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(C3903B)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3911B)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	10.000
-6.000	0.000	0.000	10.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.192

EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS



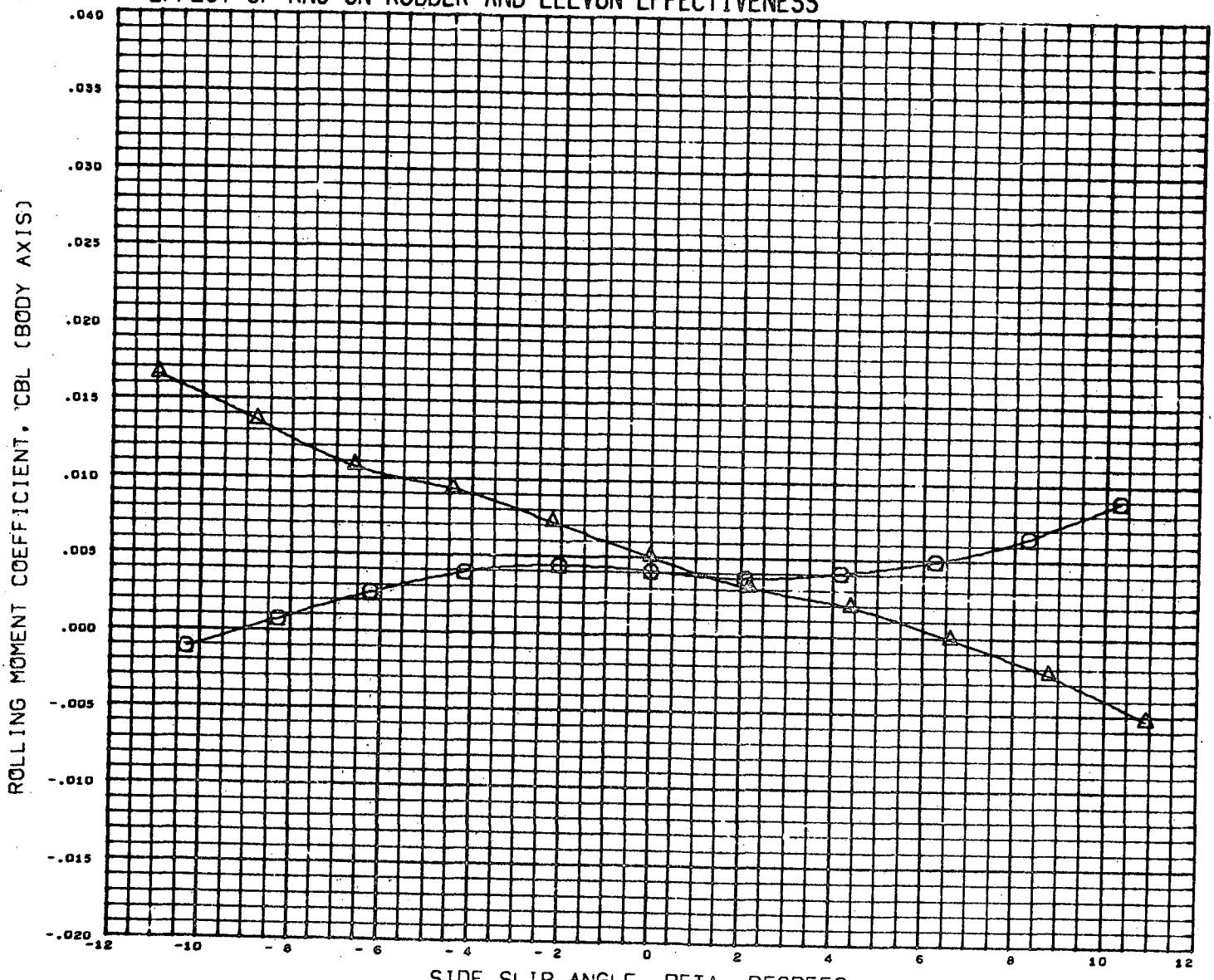
DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(C3903B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3911B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	10.000
-6.000	0.000	0.000	10.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.192

EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS



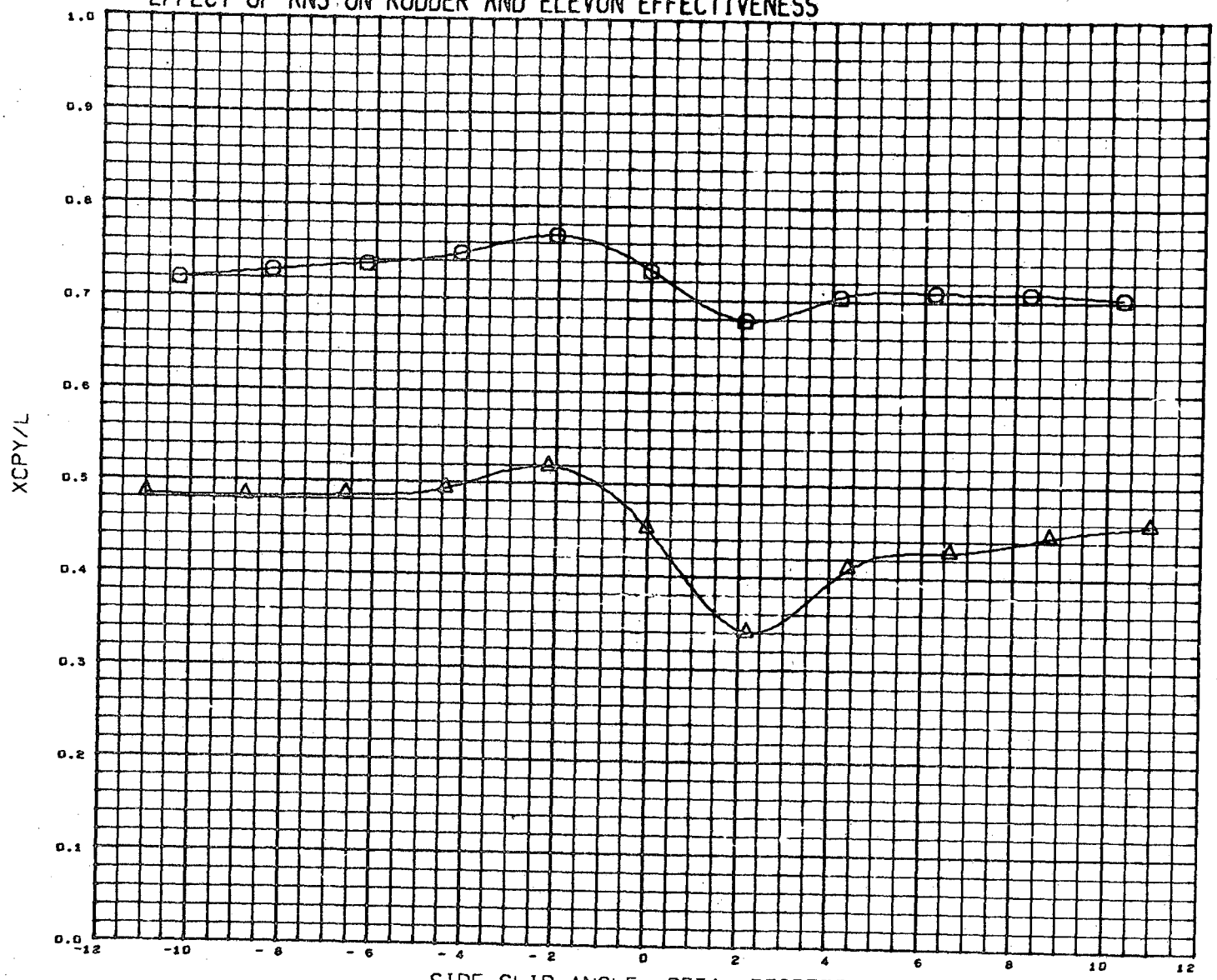
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3903B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3911B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	10.000
-6.000	0.000	0.000	10.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.192

EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3903B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3911B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

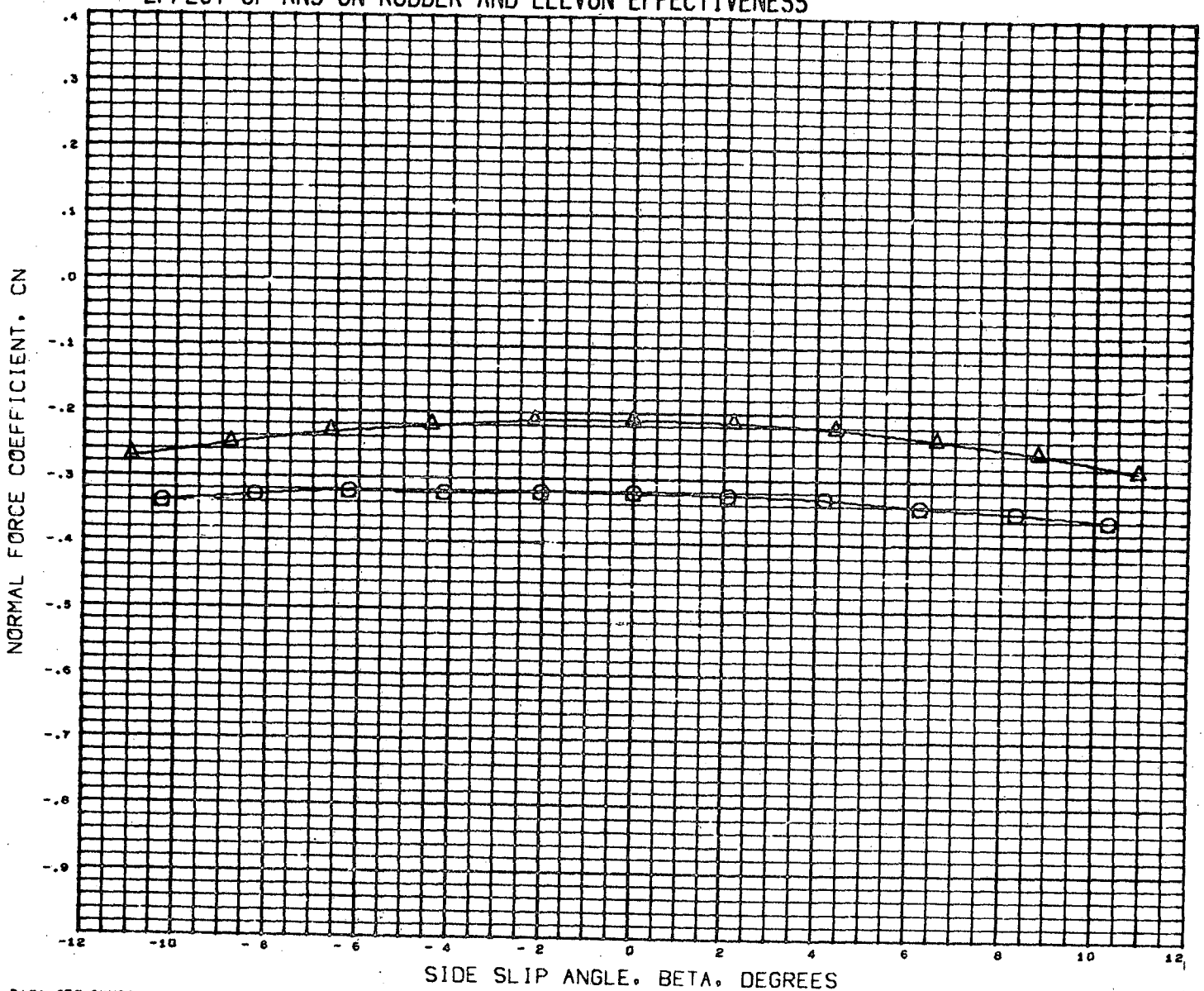
ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	10.000
-6.000	0.000	0.000	10.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.192

EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS



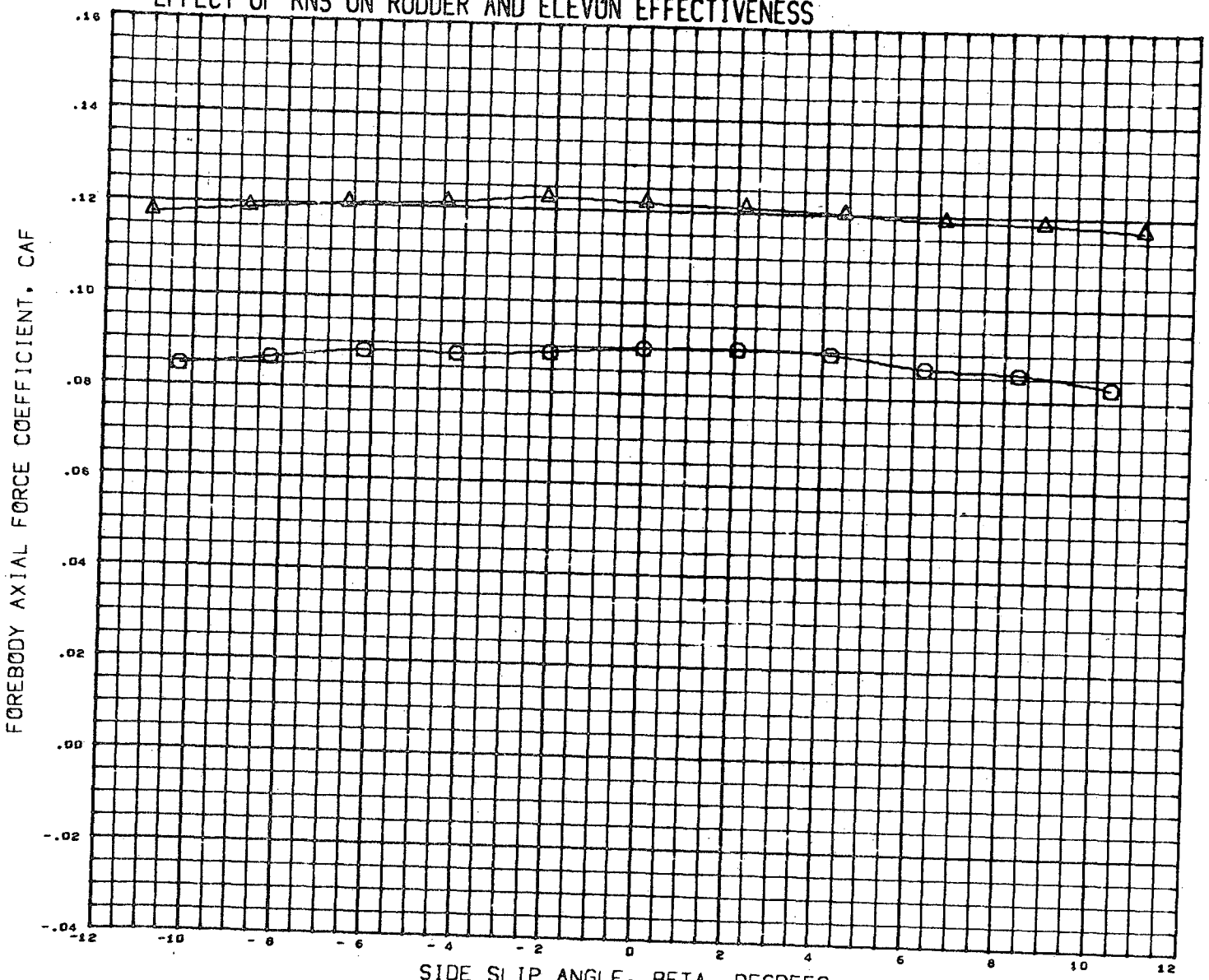
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3903B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3911B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	10.000
-6.000	0.000	0.000	10.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.192

EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3903B)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3911B)		MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

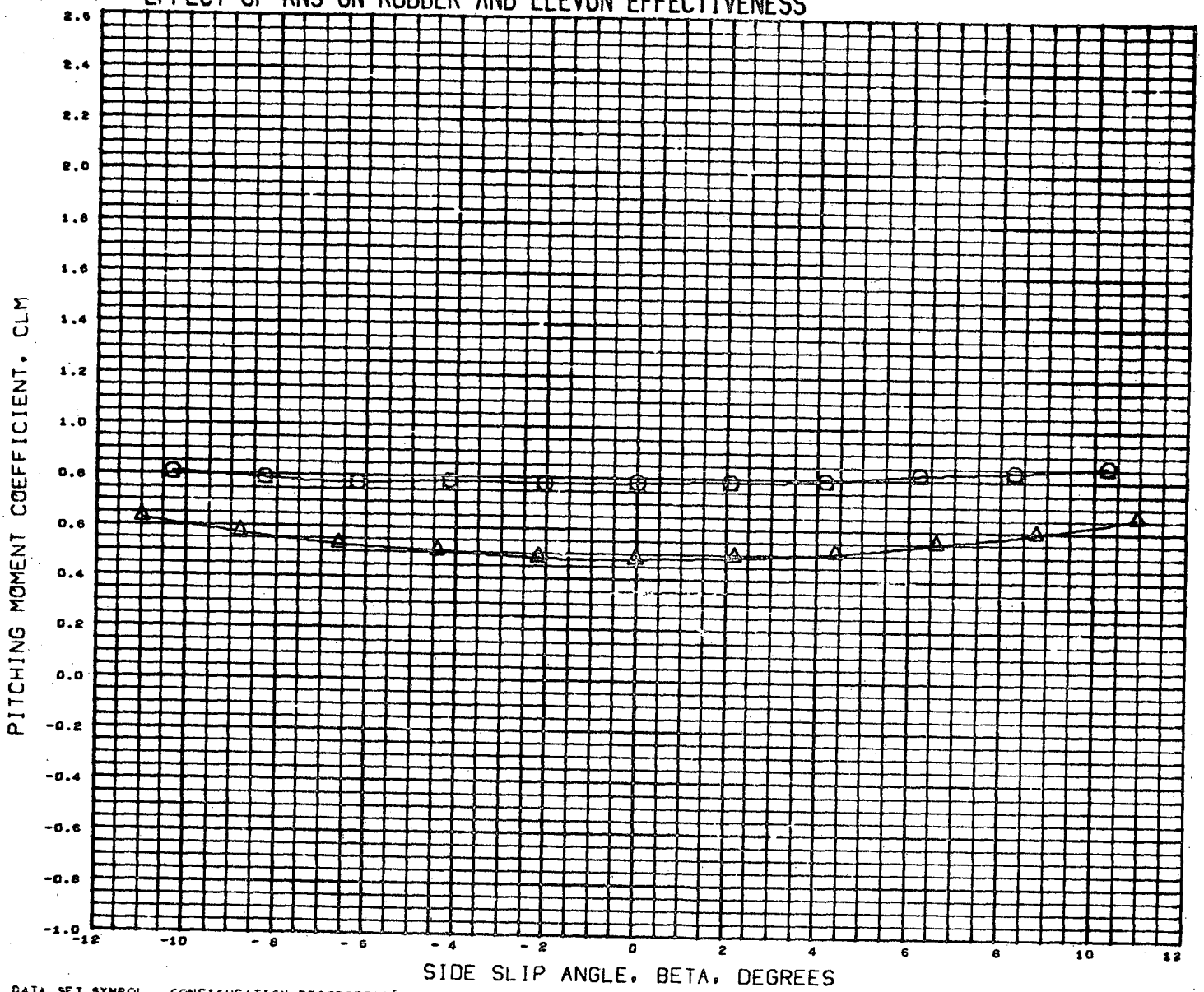
ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	10.000
-6.000	0.000	0.000	10.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.192

EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS



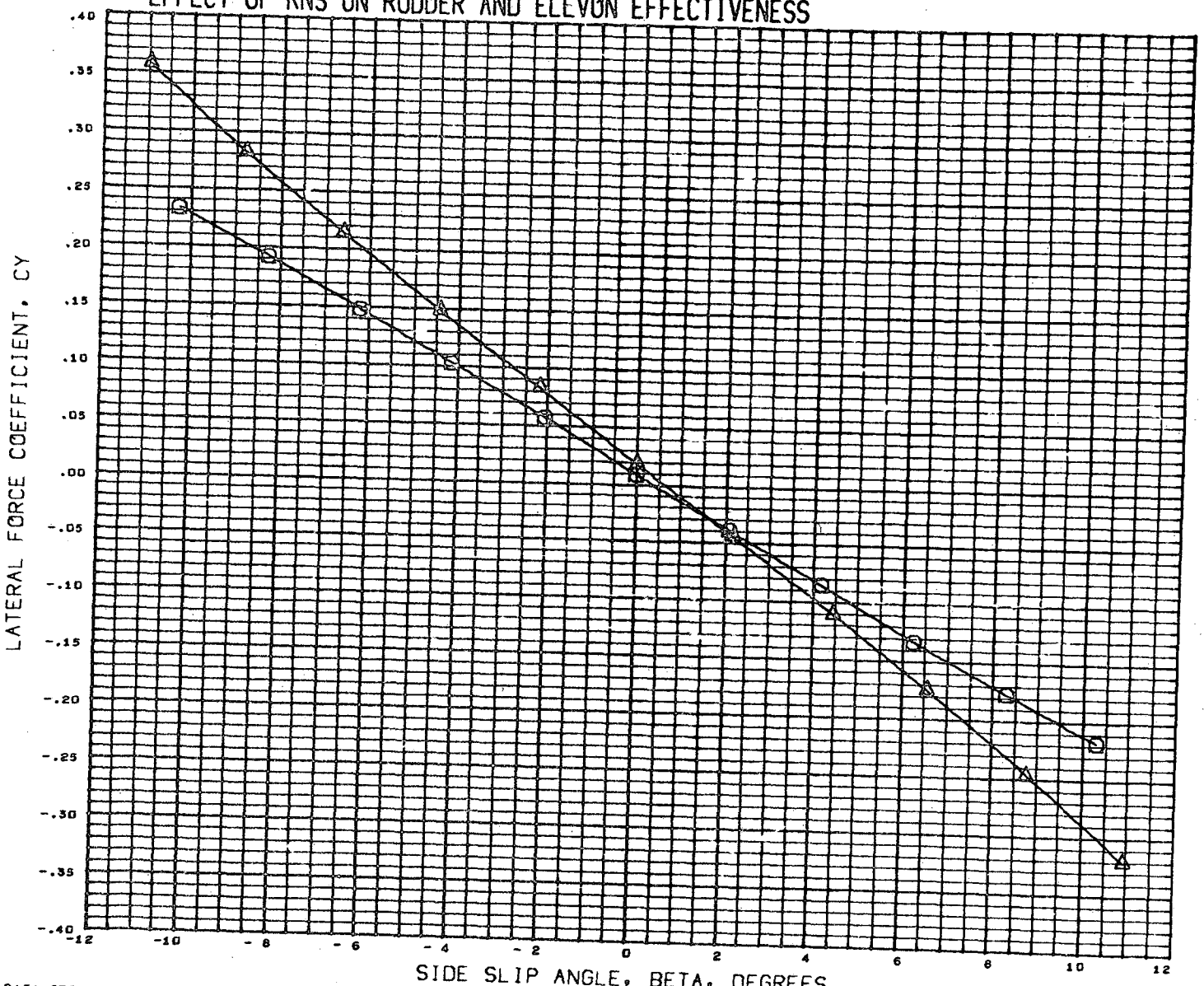
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3903B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3911B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	0.000	10.000
-6.000	0.000	0.000	10.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.192

EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS



DATA SET SYMBOL CONFIGURATION DESCRIPTION

(C3904B) MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

(C3910B) MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

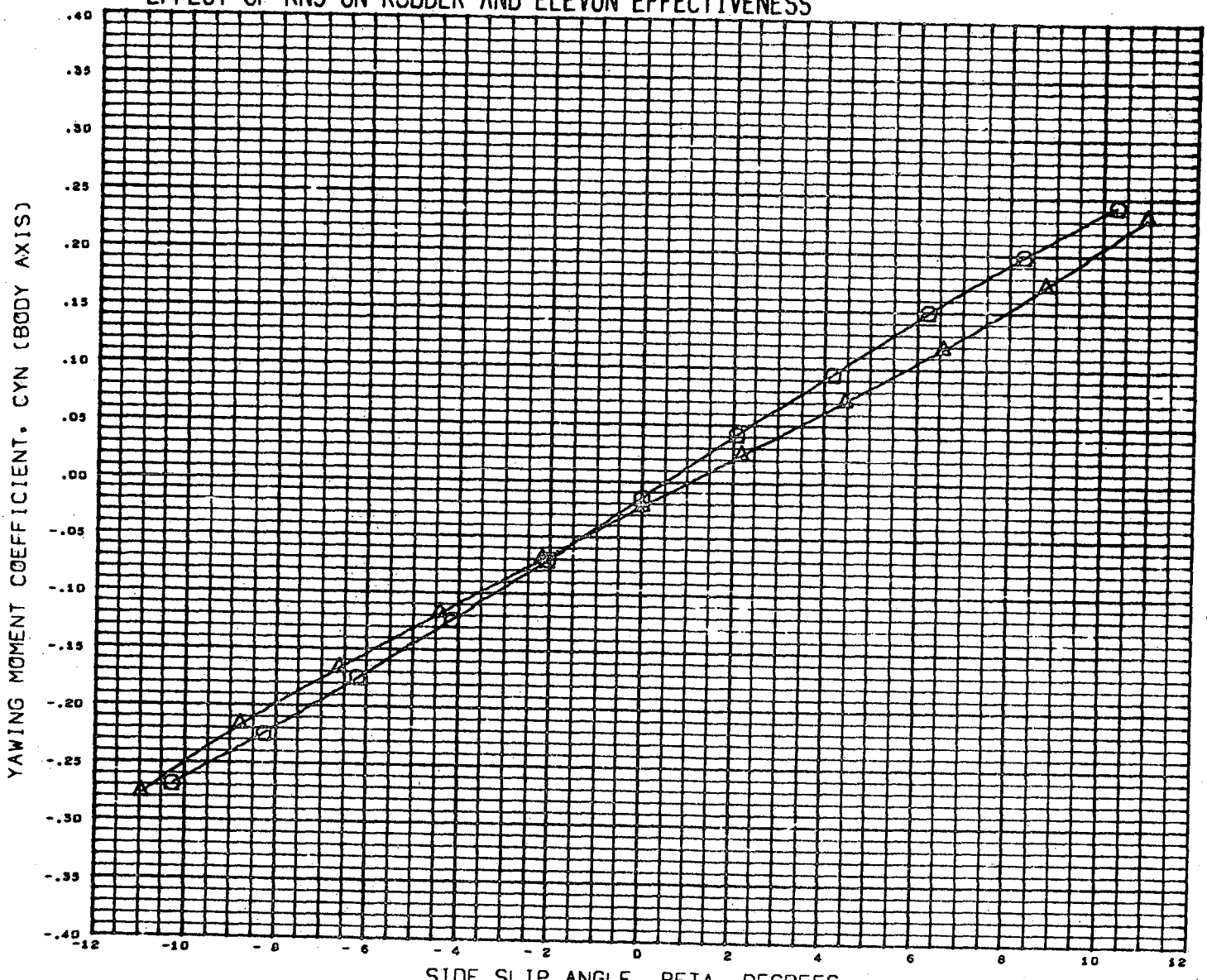
ALFHA	ELVATR	AILRON	RUDDER
-6.000	0.000	10.000	10.000
-6.000	0.000	10.000	10.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.194

EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS

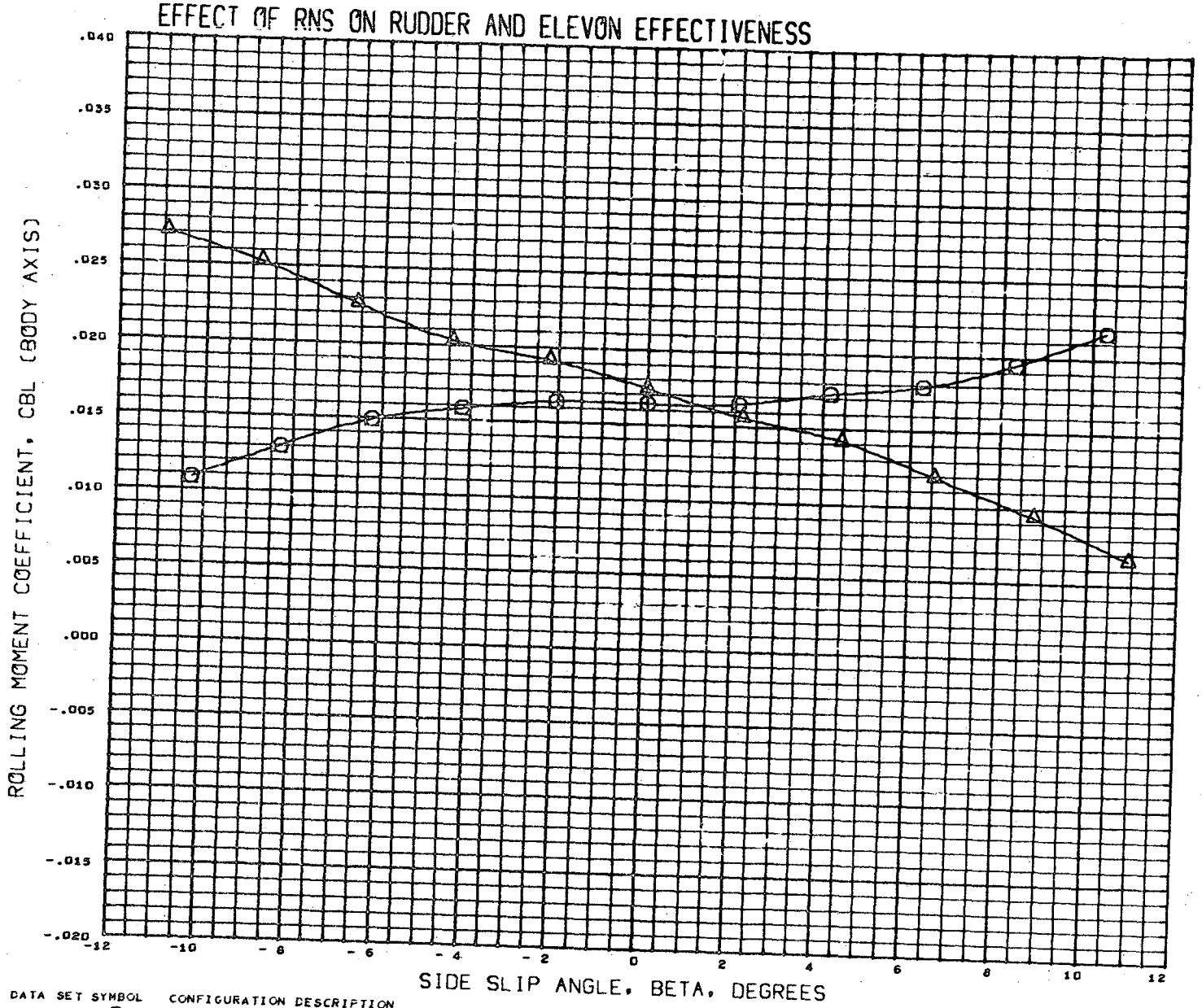


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3904B)		MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3910B)		MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	10.000	10.000
-6.000	0.000	10.000	10.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0930	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.194



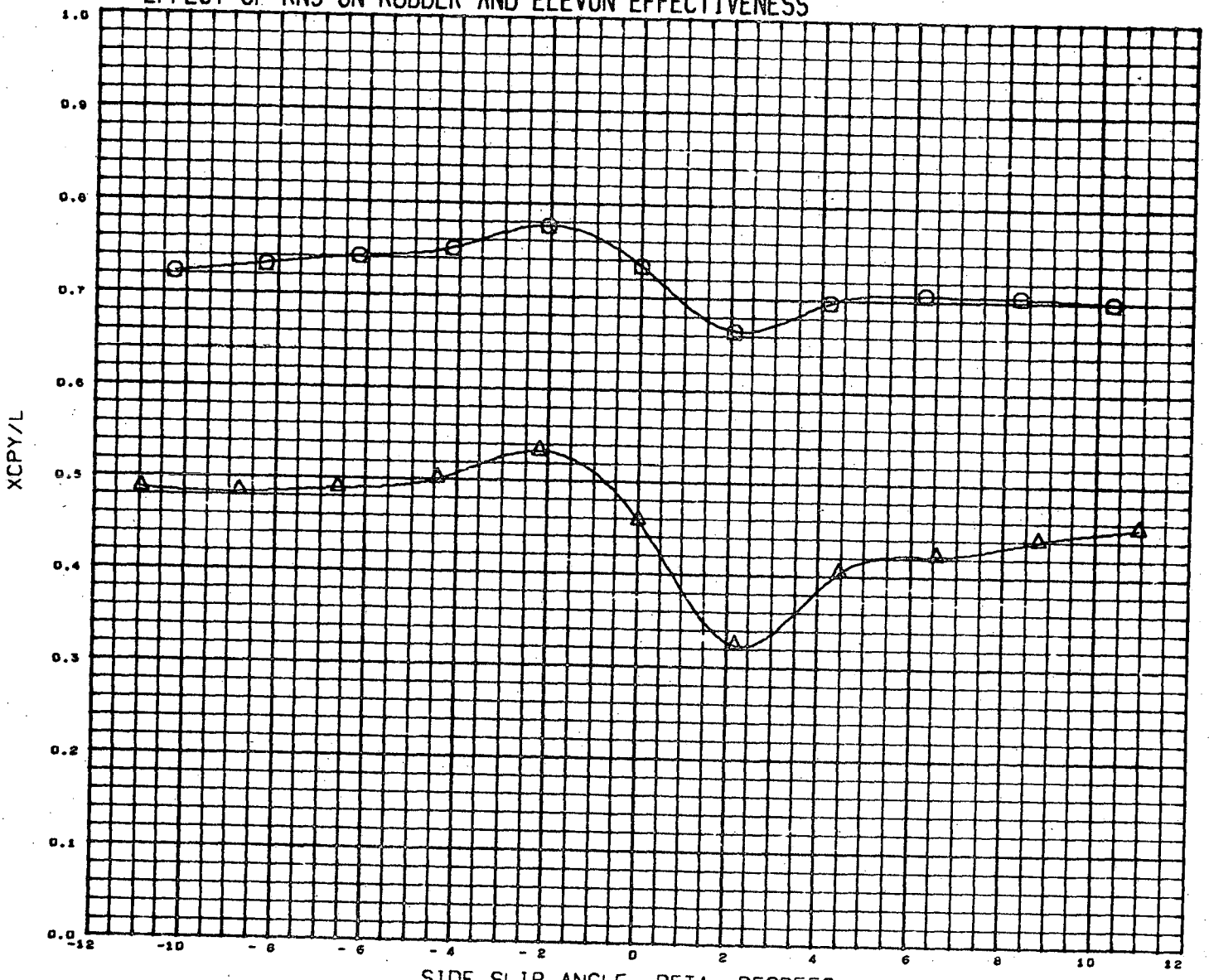
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(C3904B)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3910B)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	10.000	10.000
-6.000	0.000	10.000	10.000

MACH 1.194

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS



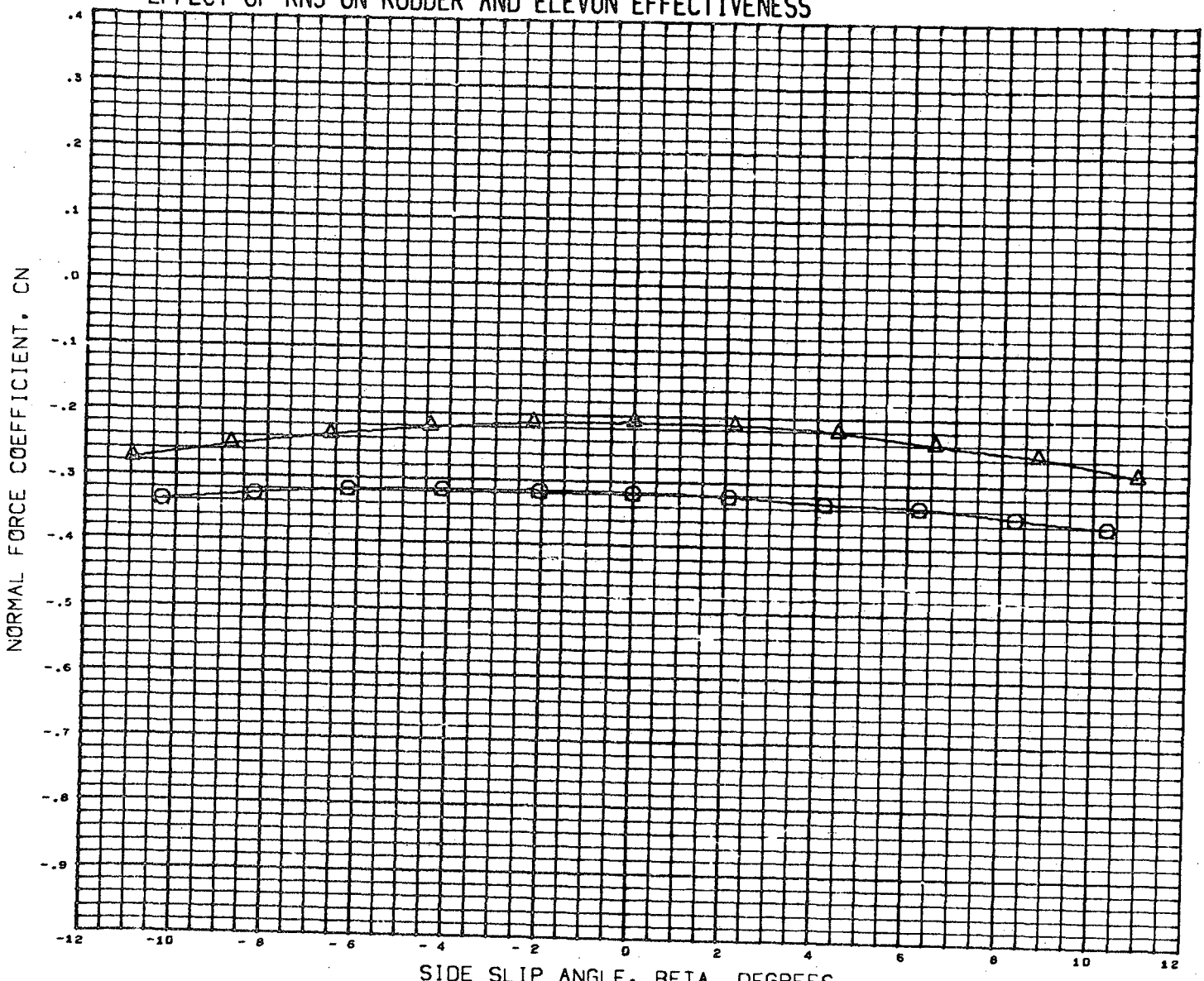
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(C3904B)	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3910B)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	10.000	10.000
-6.000	0.000	10.000	10.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

MACH 1.194

EFFECT ØF RNS ØN RUDDER AND ELEVØN EFFECTIVENESS



DATA SET SYMBOL CONFIGURATION DESCRIPTION

(C3904B) MSFC497 GD DELTA WING BOOSTER B19W14C4AV7

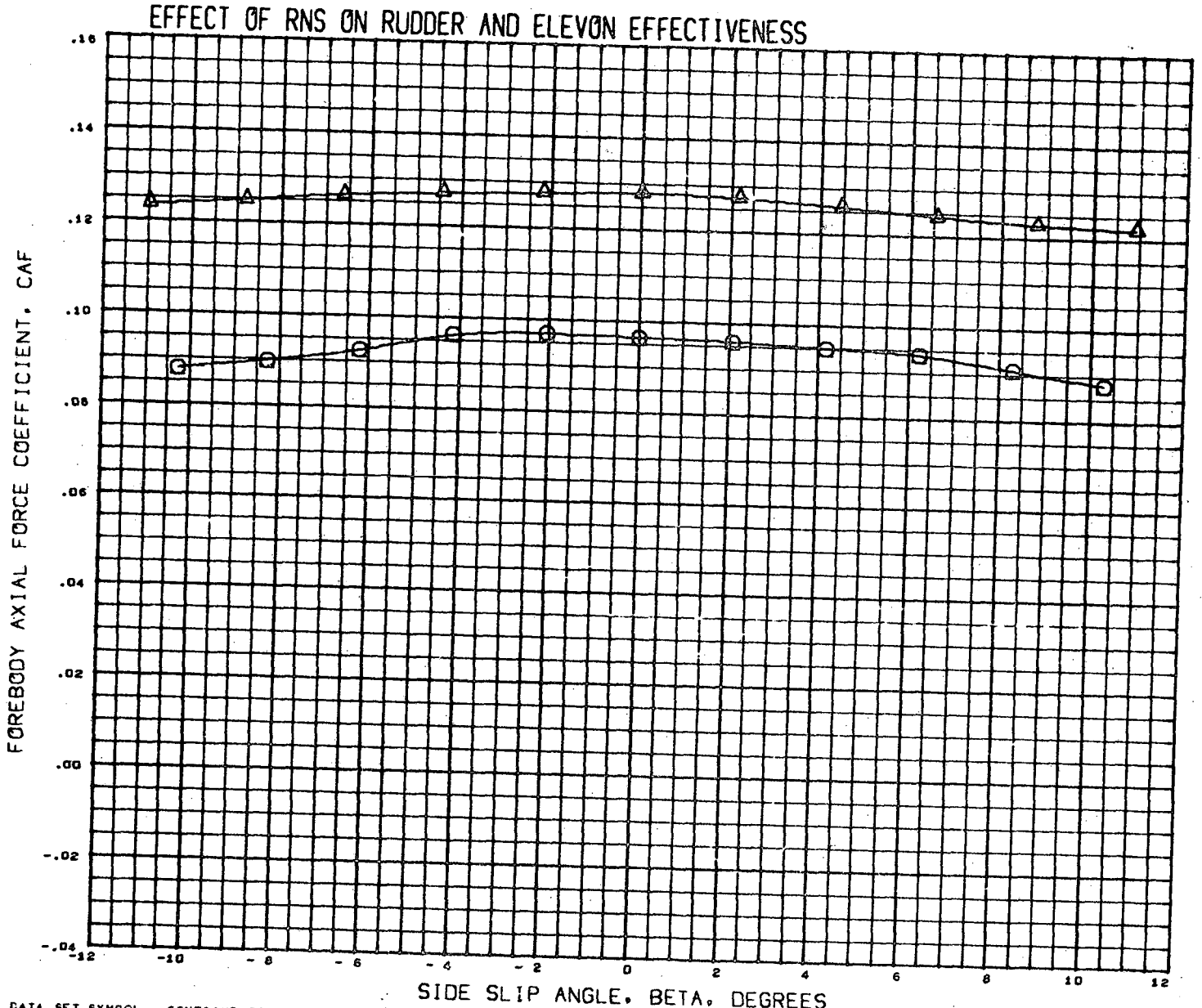
(C3910B) MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	10.000	10.000
-6.000	0.000	10.000	10.000

MACH 1.194

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3904B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3910B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

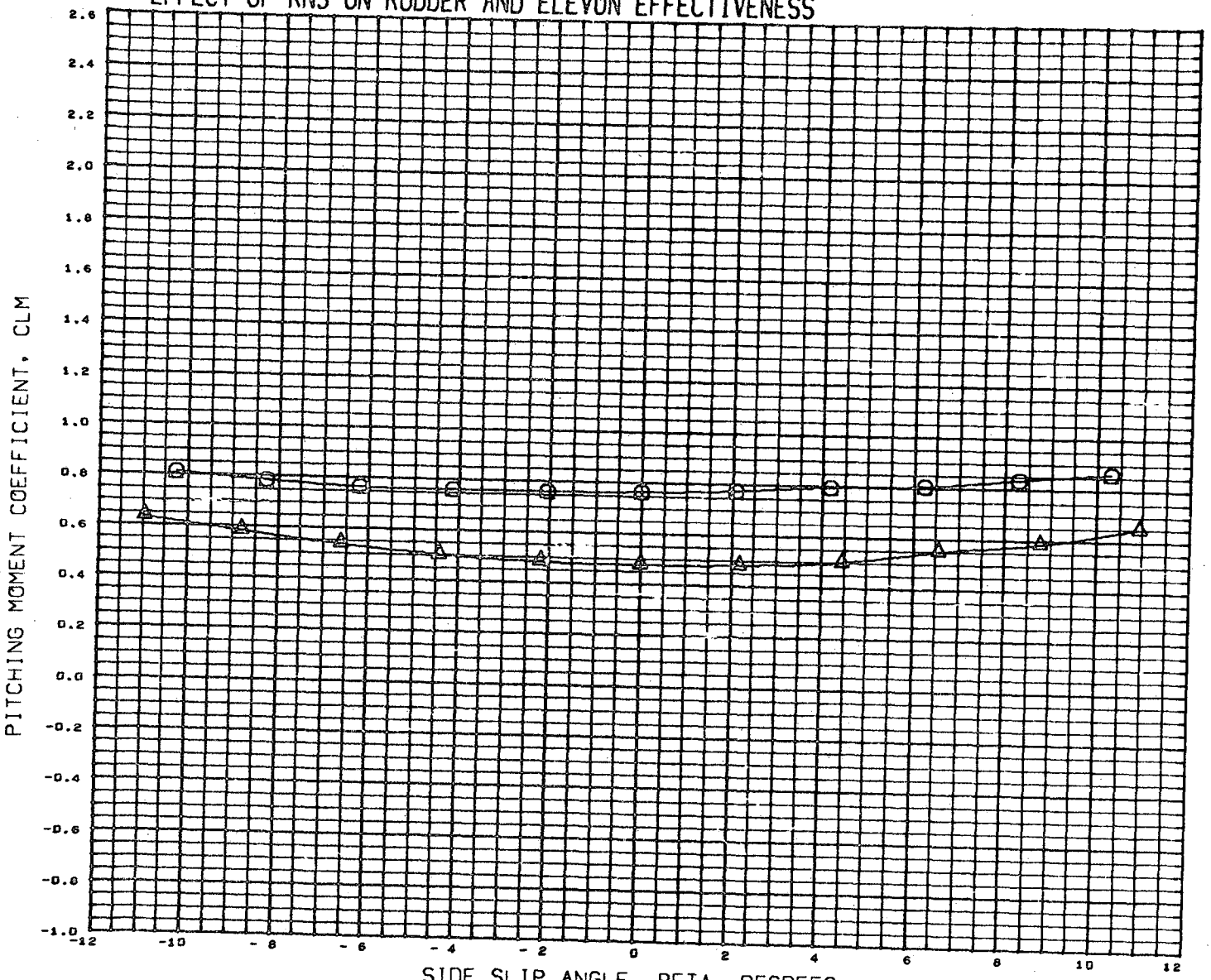
ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	10.000	10.000
-6.000	0.000	10.000	10.000

MACH 1.194

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF RNS ON RUDDER AND ELEVON EFFECTIVENESS

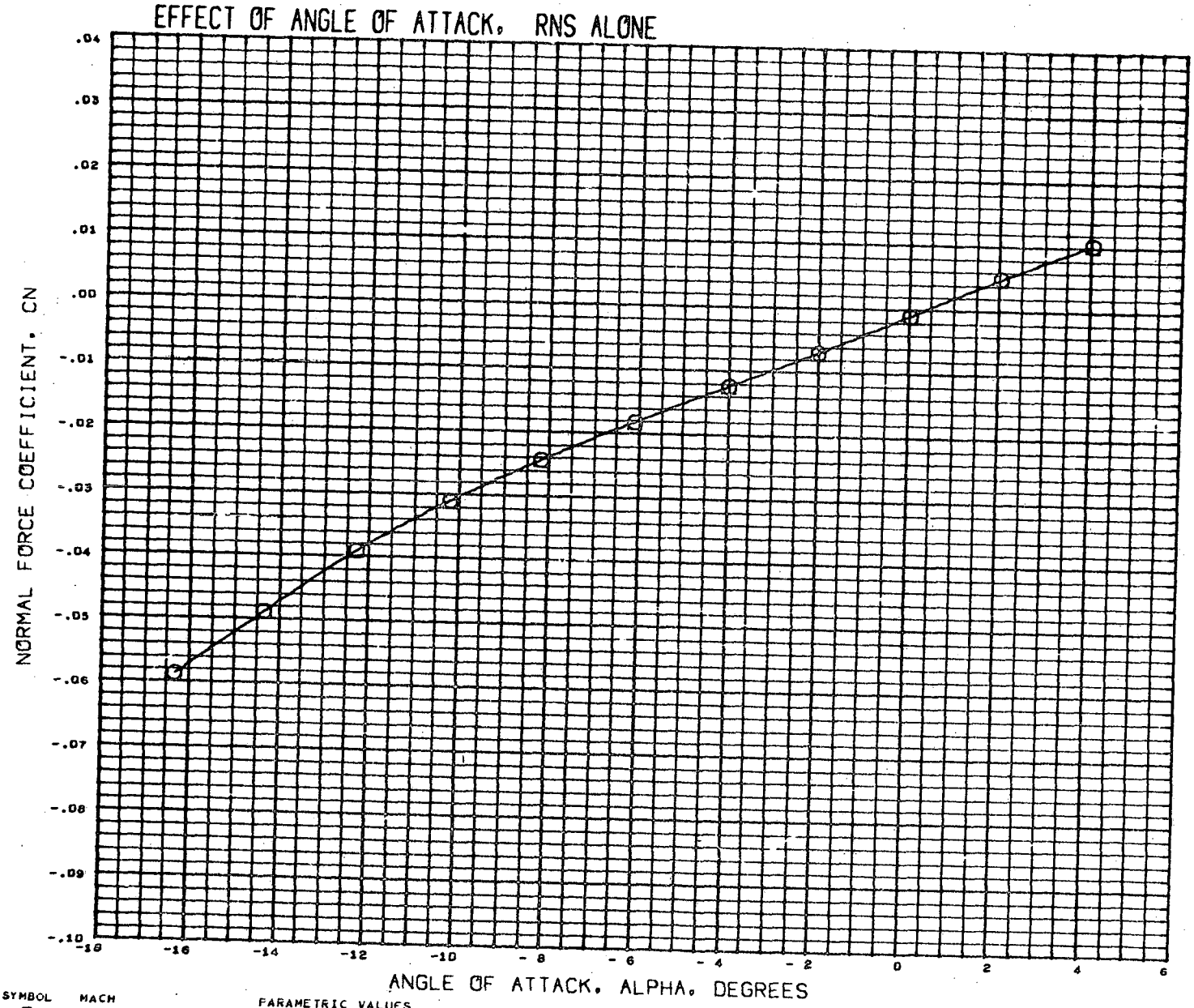


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(C3904B)	○	MSFC497 GD DELTA WING BOOSTER B19W14C4AV7
(C3910B)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS

MACH 1.194

ALPHA	ELVATR	AILRON	RUDDER
-6.000	0.000	10.000	10.000
-6.000	0.000	10.000	10.000

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

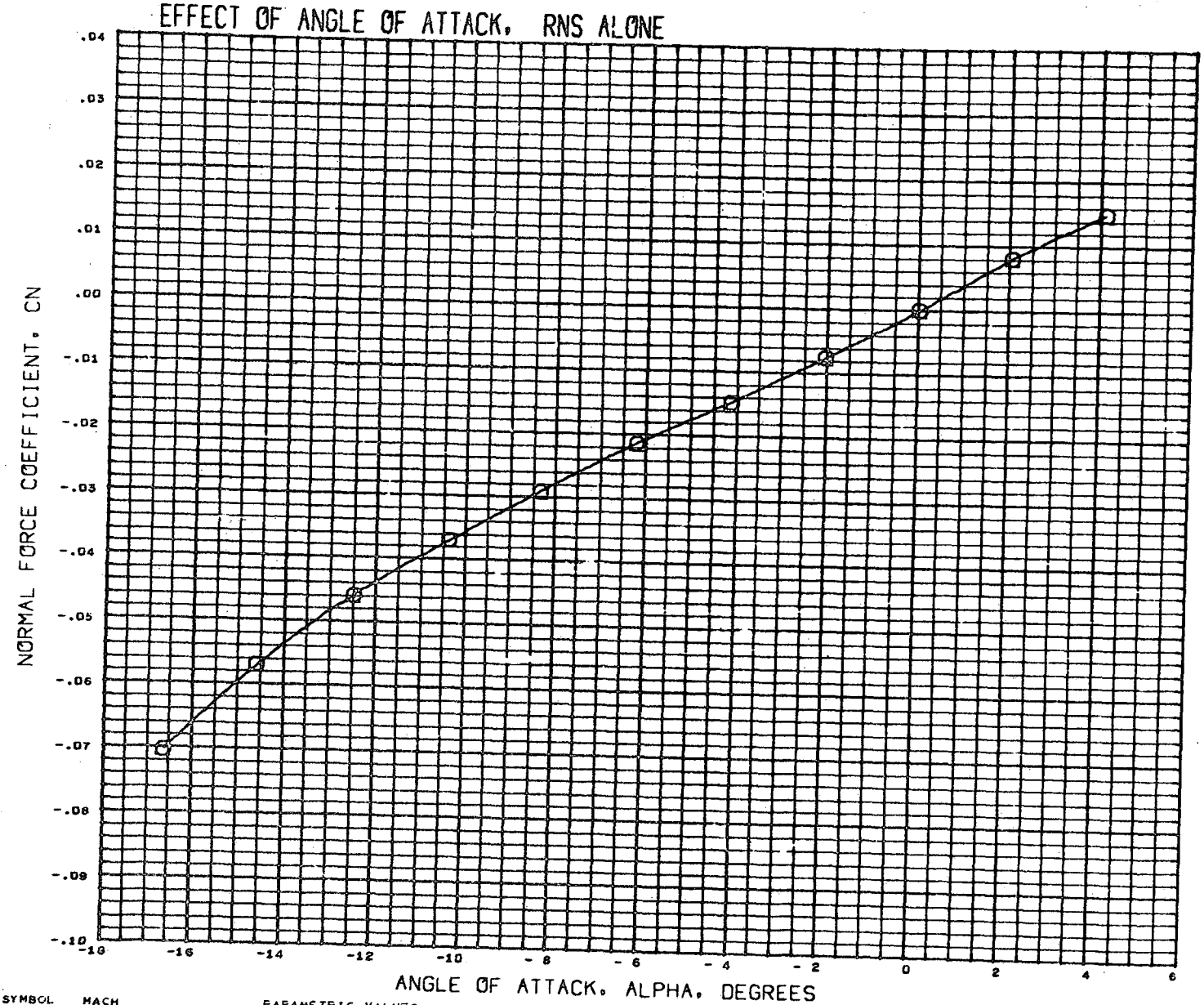


SYMBOL	MACH		PARAMETRIC VALUES		
O	0.601	BETA	0.000	GRIT	54.000

DATA HIST. CODE M

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP -	1.1320	INCHES
SCALE	0.0031	SCALE



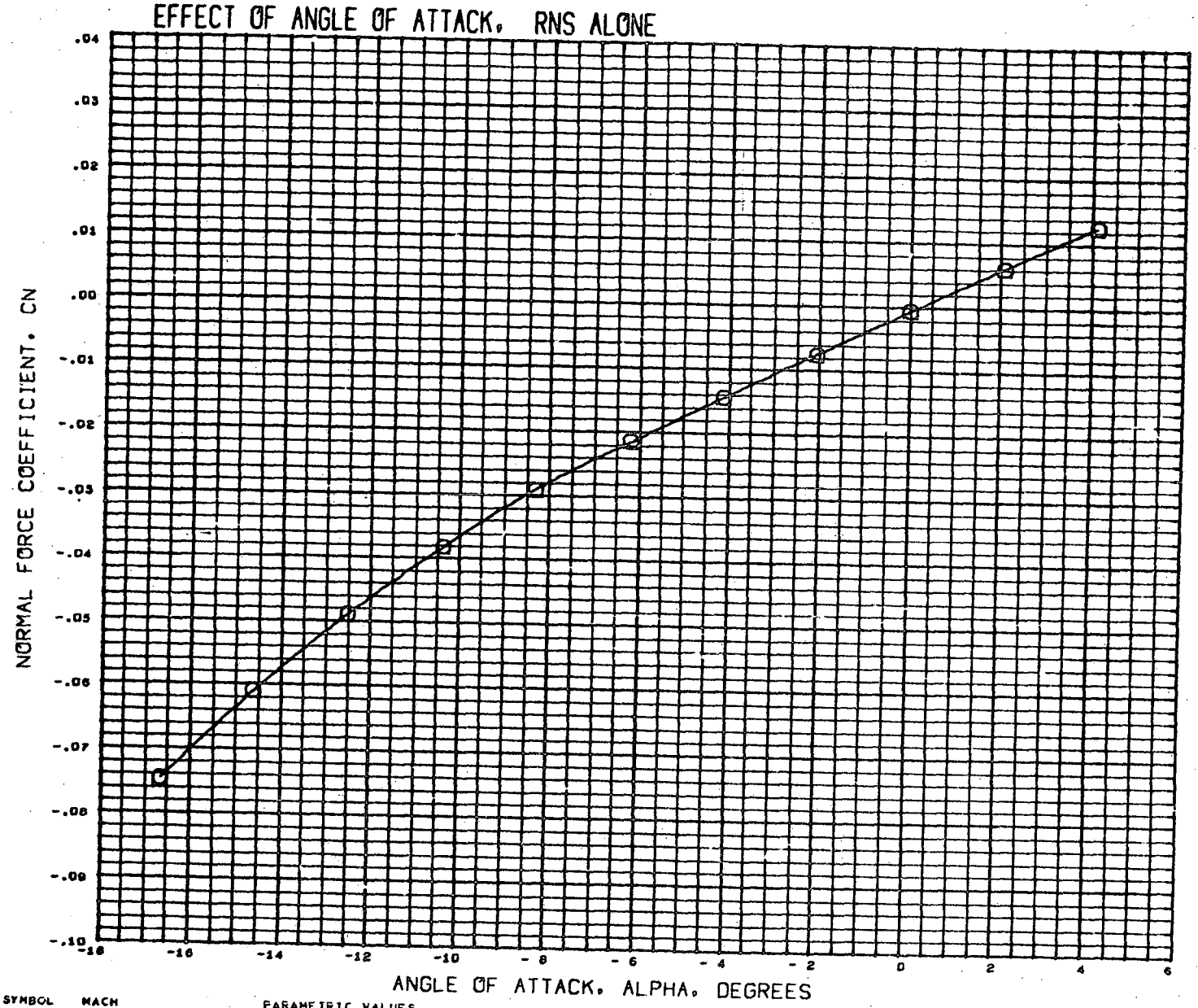
SYMBOL MACH PARAMETRIC VALUES

O 0.954 BETA 0.000 GRIT 54.000

DATA HIST. CODE H

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP	1.1320	INCHES
SCALE	0.0031	SCALE

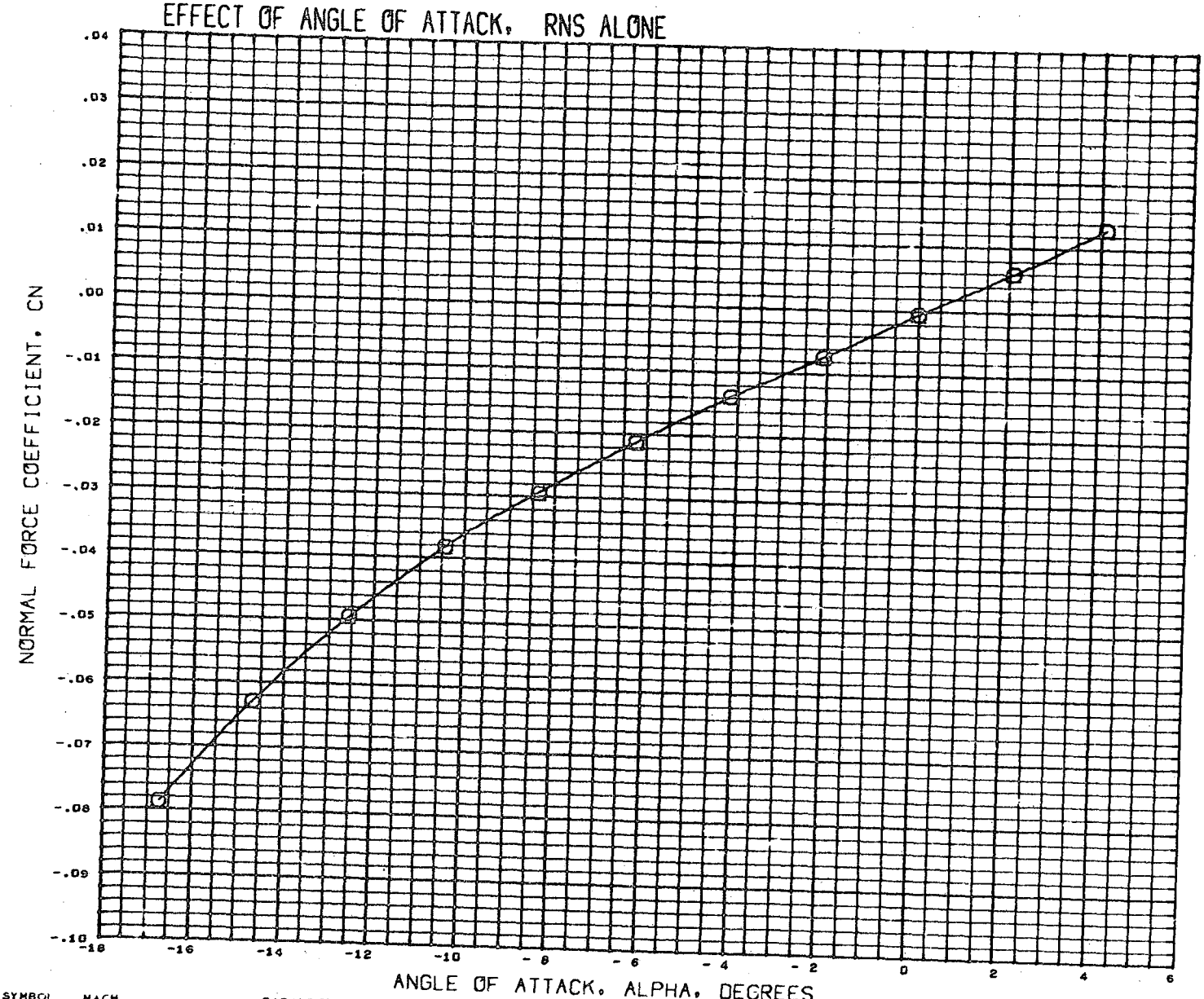


SYMBOL	MACH		PARAMETRIC VALUES		
O	1.002	BETA	0.000	GRIT	54.000

DATA HIST. CODE M

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP -	1.3320	INCHES
SCALE	0.0031	SCALE



SYMBOL MACH PARAMETRIC VALUES

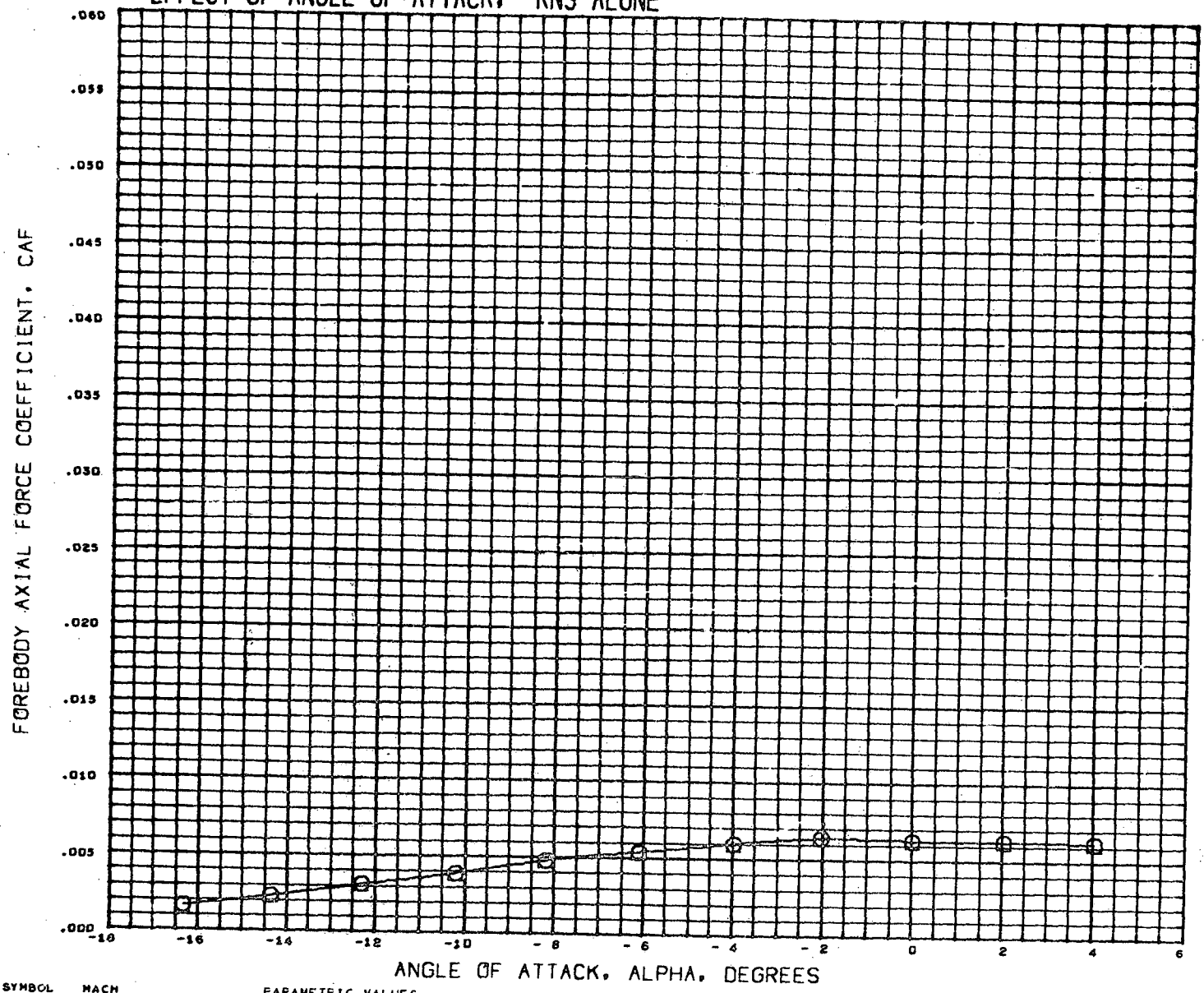
O 1.191 BETA 0.000 GRIT 54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP	-.3320	INCHES
SCALE	0.0031	SCALE

DATA HIST. CODE M

EFFECT OF ANGLE OF ATTACK, RNS ALONE



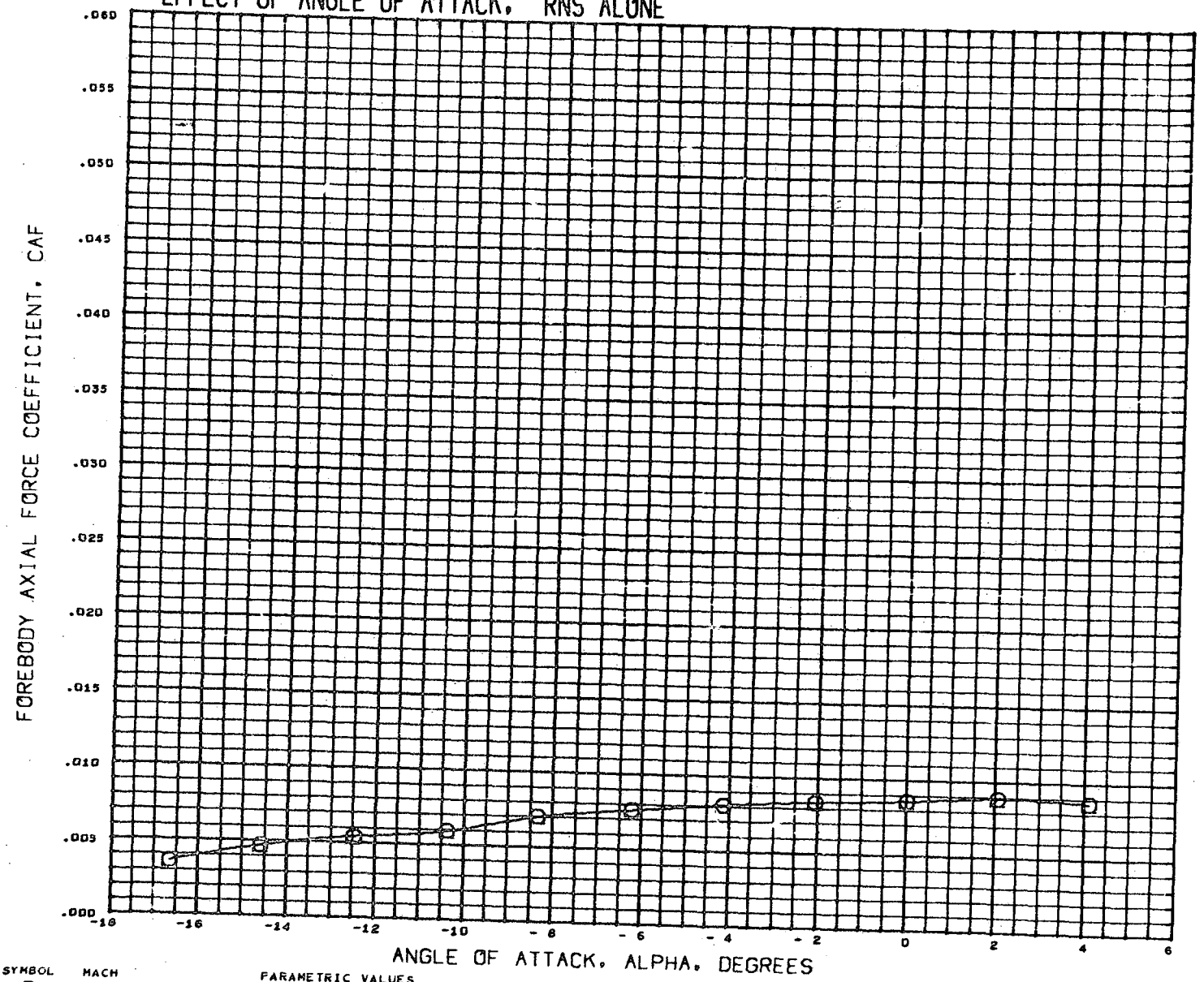
SYMBOL	MACH	PARAMETRIC VALUES			
O	0.601	BETA	0.000	GRIT	54.000

DATA HIST. CODE H

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP	1.3320	INCHES
SCALE	0.0031	SCALE

EFFECT OF ANGLE OF ATTACK, RNS ALONE



SYMBOL MACH — PARAMETRIC VALUES

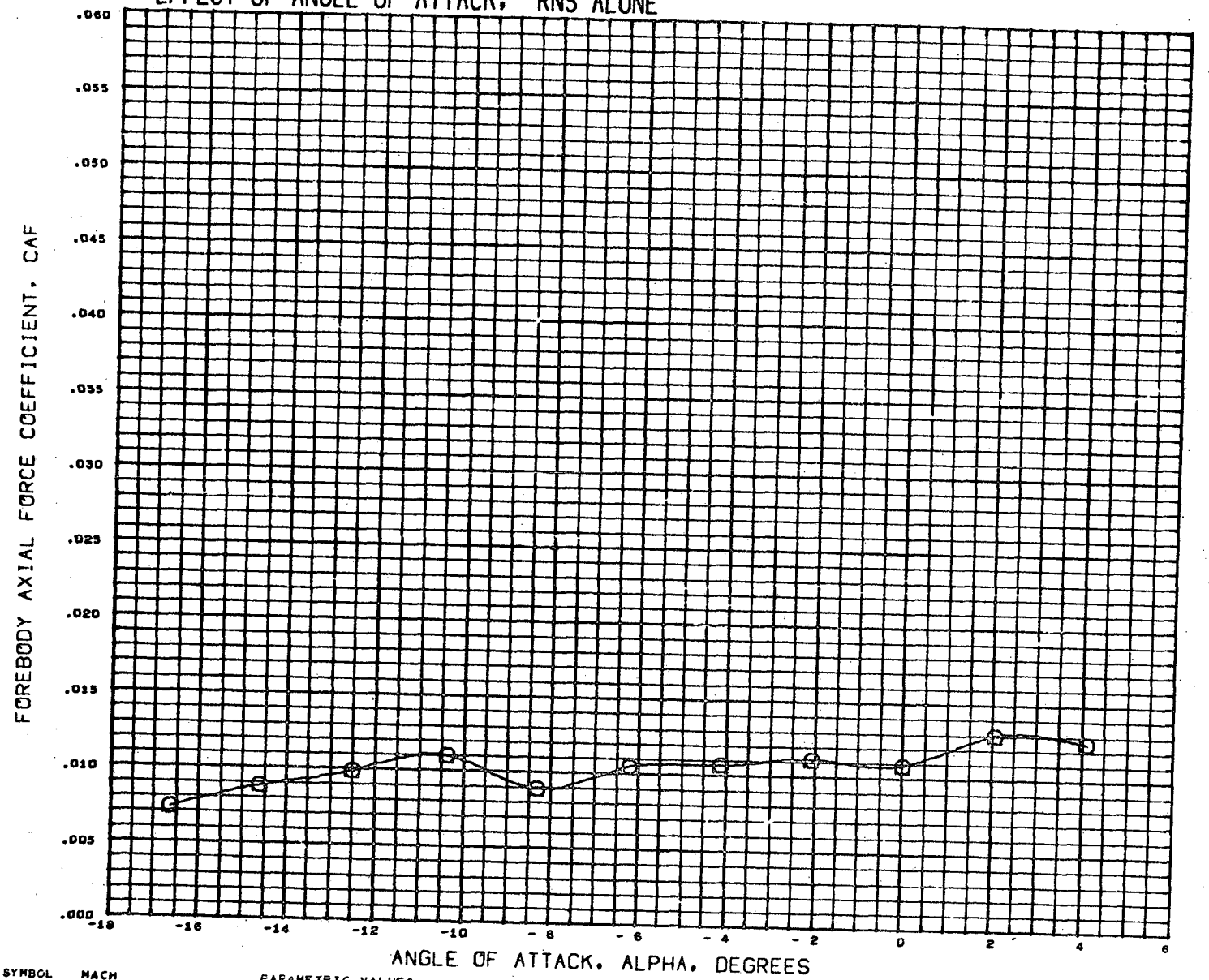
O 0.954 BETA 0.000 GRIT 54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP -	1.3320	INCHES
SCALE	0.0031	SCALE

DATA HIST. CODE M

EFFECT OF ANGLE OF ATTACK, RNS ALONE



SYMBOL	MACH	PARAMETRIC VALUES			
O	1.002	BETA	0.000	GRIT	54.000

DATA HIST. CODE M

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP	1.3320	INCHES
SCALE	0.0031	SCALE

SYMBOL MACH PARAMETRIC VALUES

O 1.191 BETA 0.000 GRIT 54.000

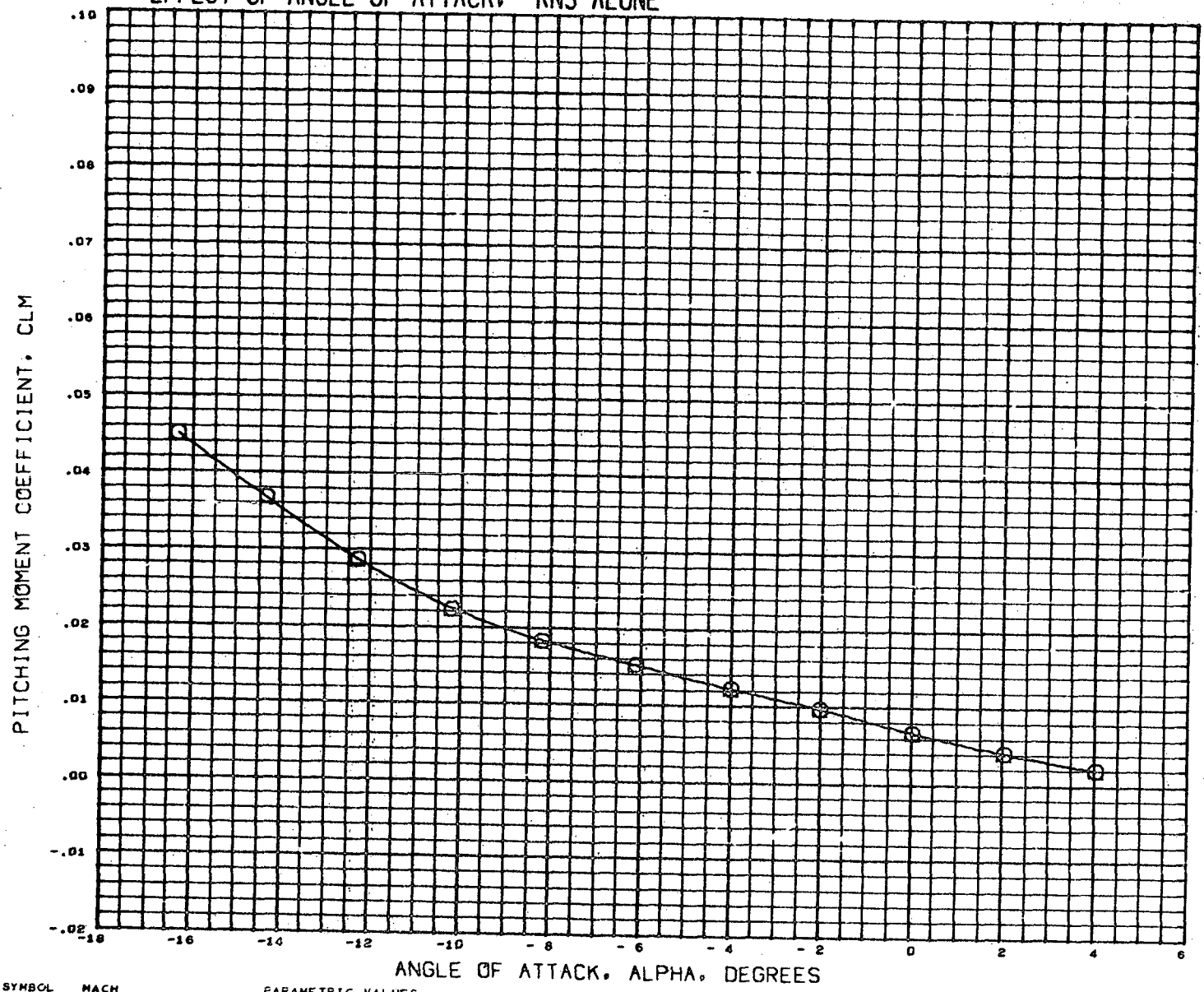
REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP	1.3320	INCHES
SCALE	0.0031	SCALE

DATA HIST. CODE H

MSFC497 NR REUSABLE NUCLEAR STAGE RNS (A3913A) 28 AUG 71 PAGE 155

EFFECT OF ANGLE OF ATTACK, RNS ALONE



SYMBOL MACH PARAMETRIC VALUES

O 0.601 BETA 0.000 GRIT 54.000

DATA HIST. CODE M

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
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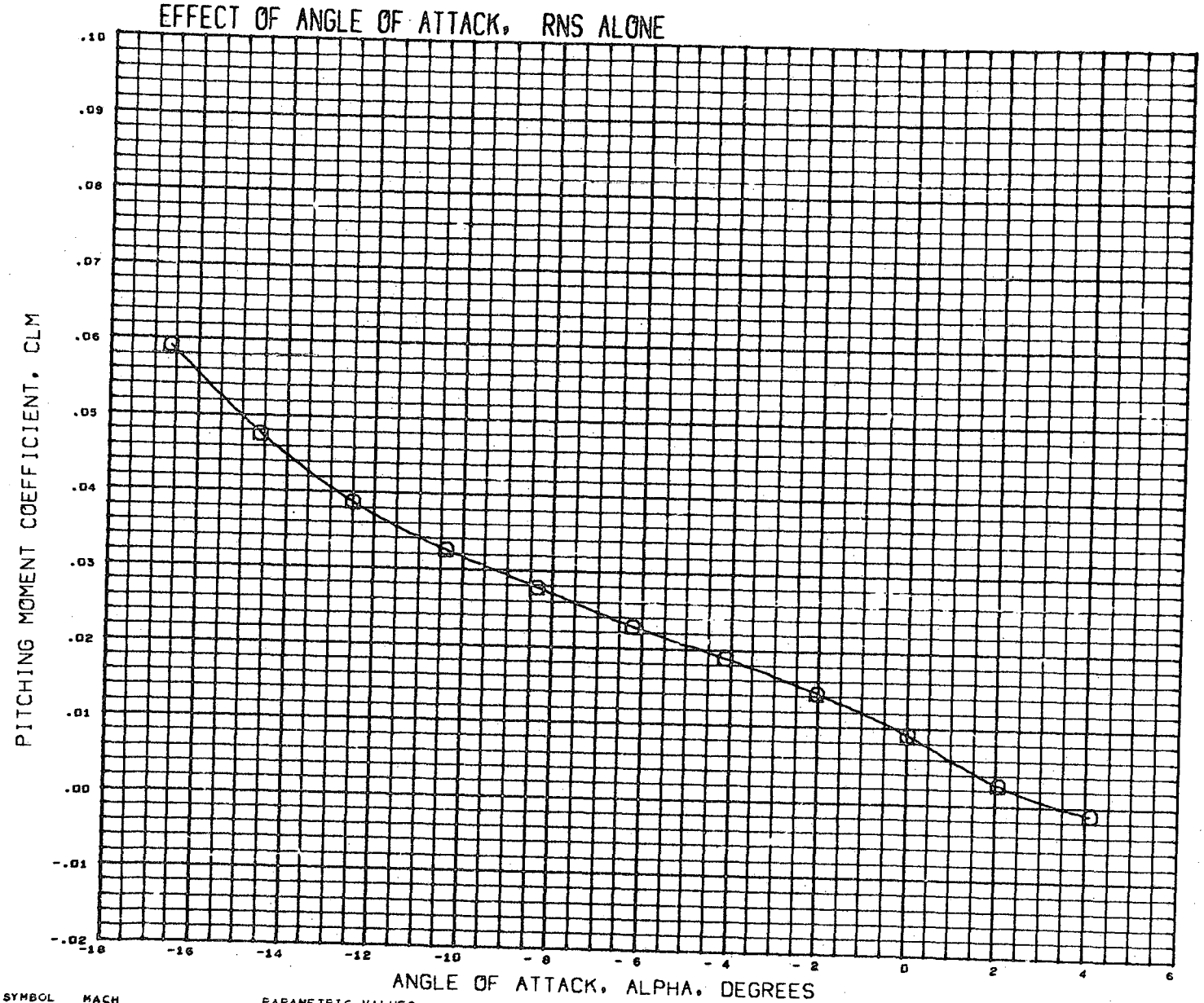
YMRP	0.0000	
ZMRP	1.3320	INCHES
SCALE	0.0031	SCALE



SYMBOL MACH PARAMETRIC VALUES

O 0.954 BETA 0.000 GRIT 54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
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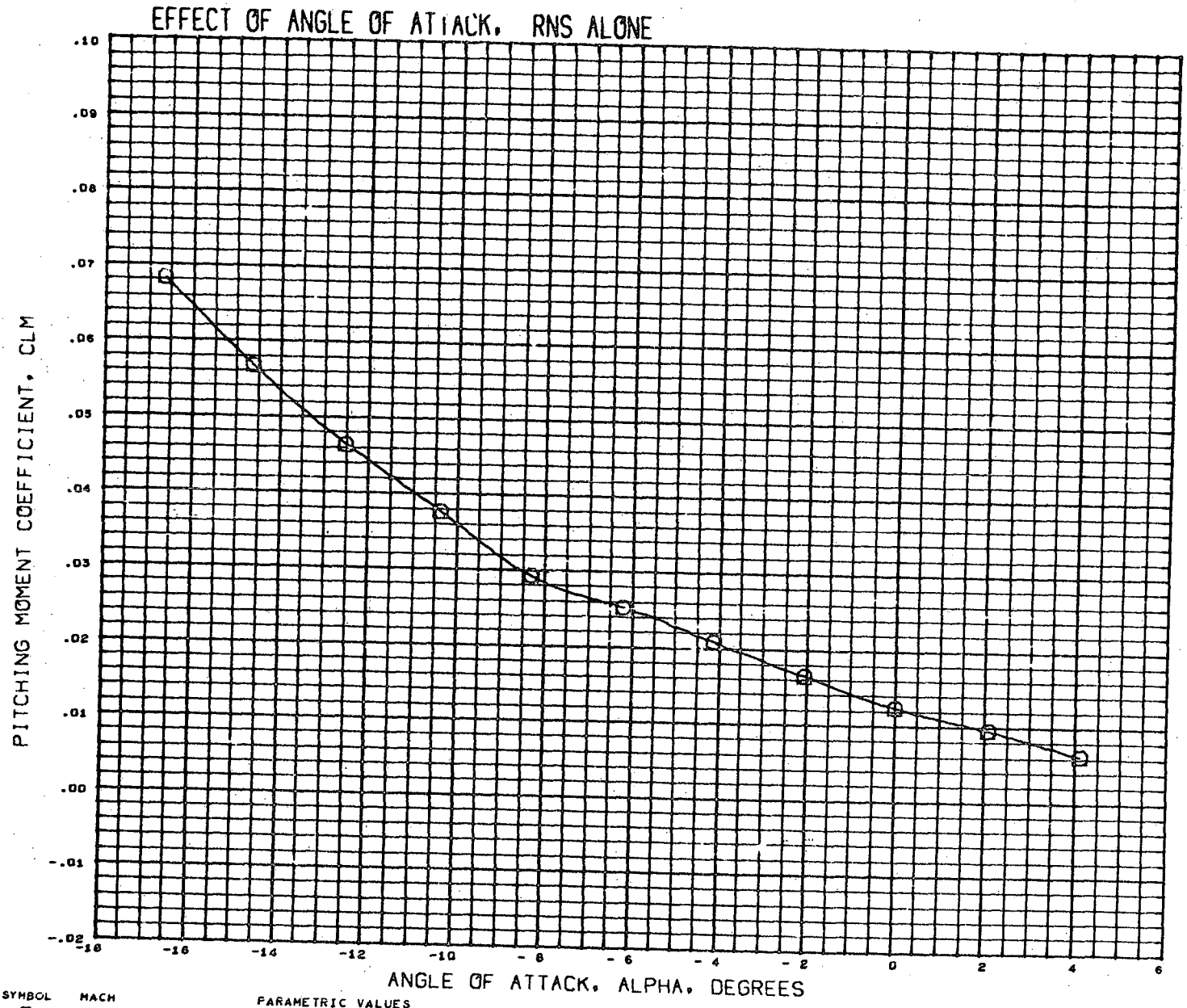
SCALE	0.0031	SCALE

DATA HIST. CODE H



SYMBOL MACH PARAMETRIC VALUES

Q 1.002 BETA 0.000 GRIT 54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRF	1.5610	INCHES
YMRF	0.0000	
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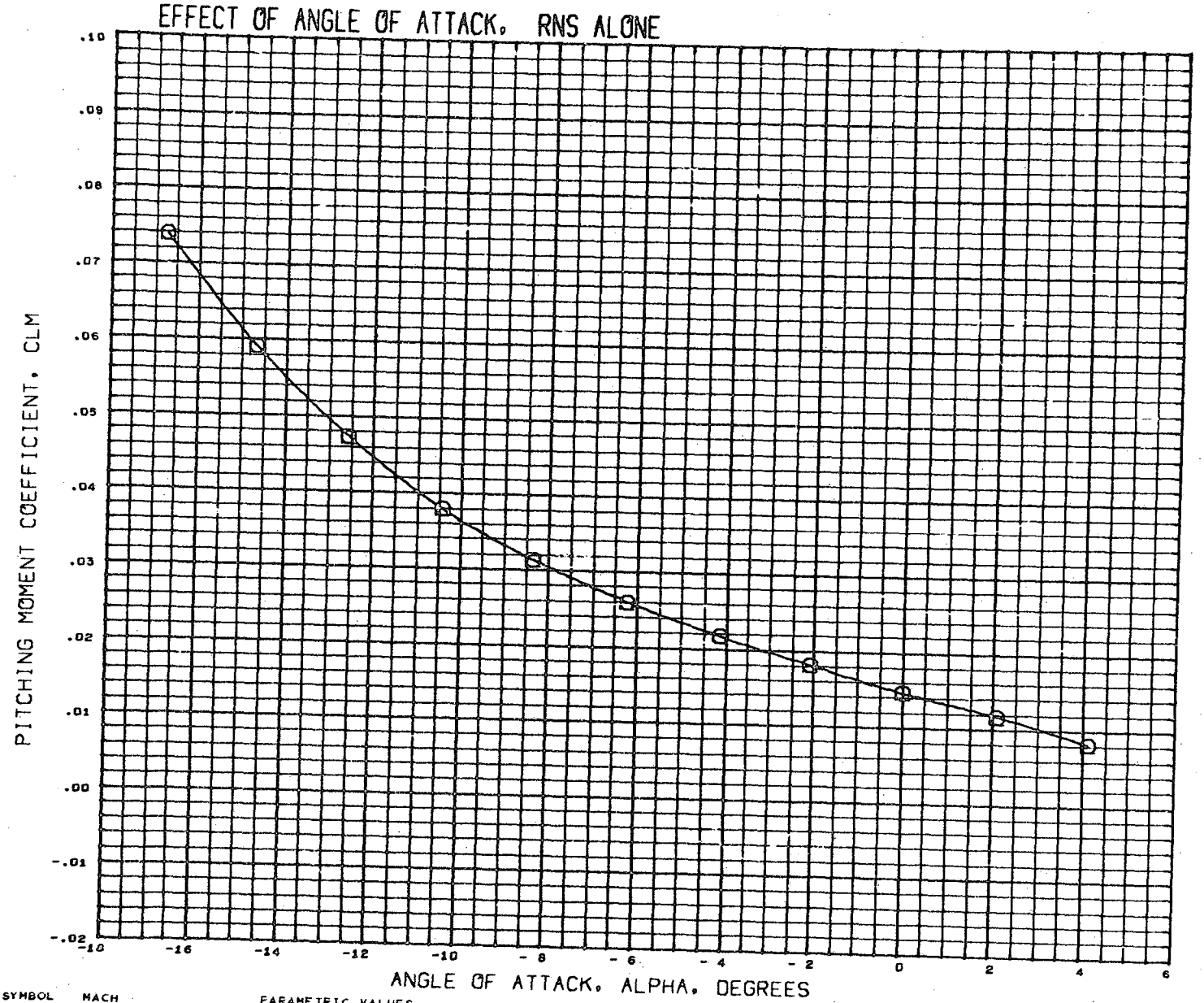
SCALE	0.0031	SCALE

DATA HIST. CODE H



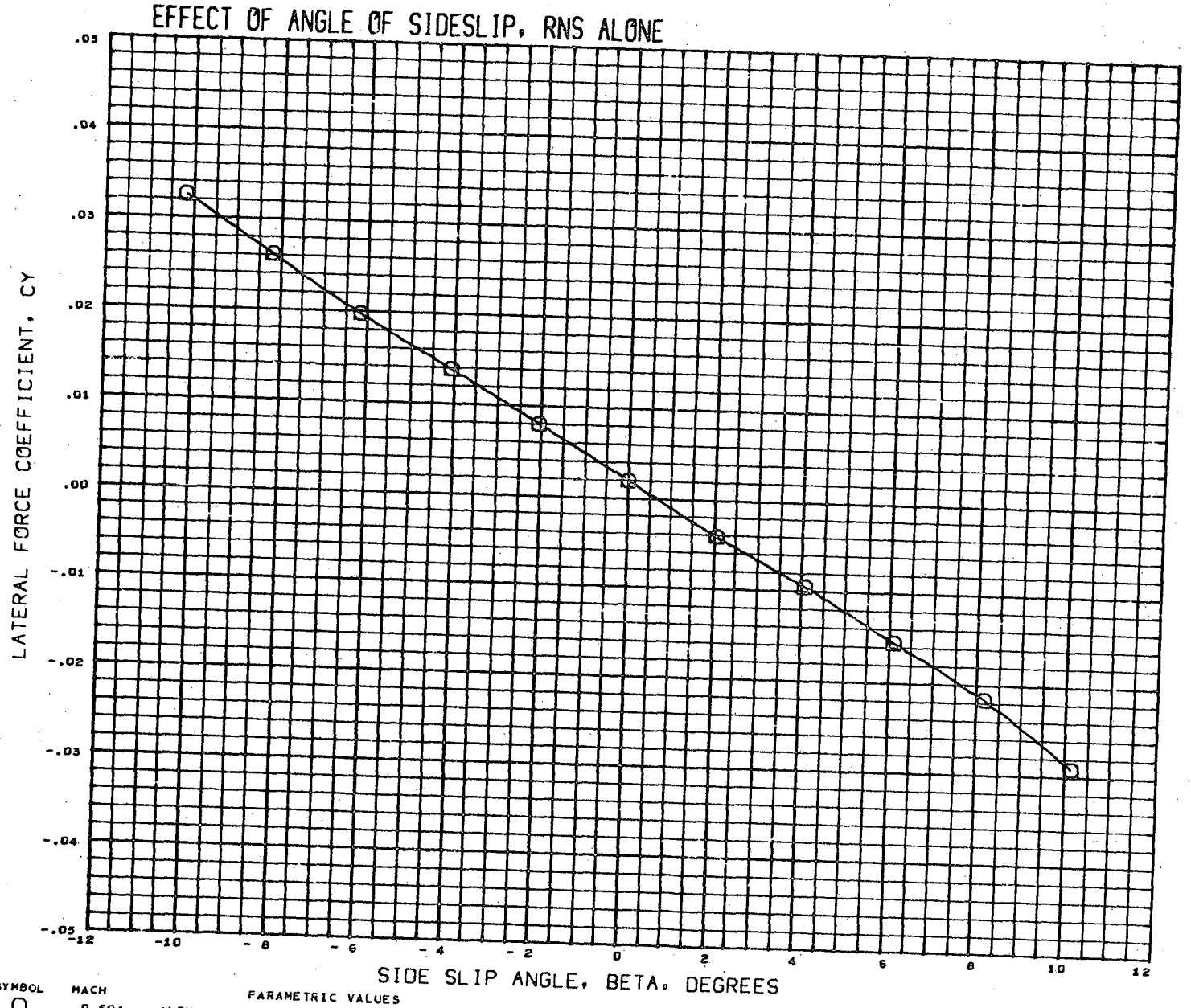
SYMBOL MACH PARAMETRIC VALUES

O 1.191 BETA 0.000 GRIT 54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP	1.3320	INCHES
SCALE	0.0031	SCALE

DATA HIST. CODE H



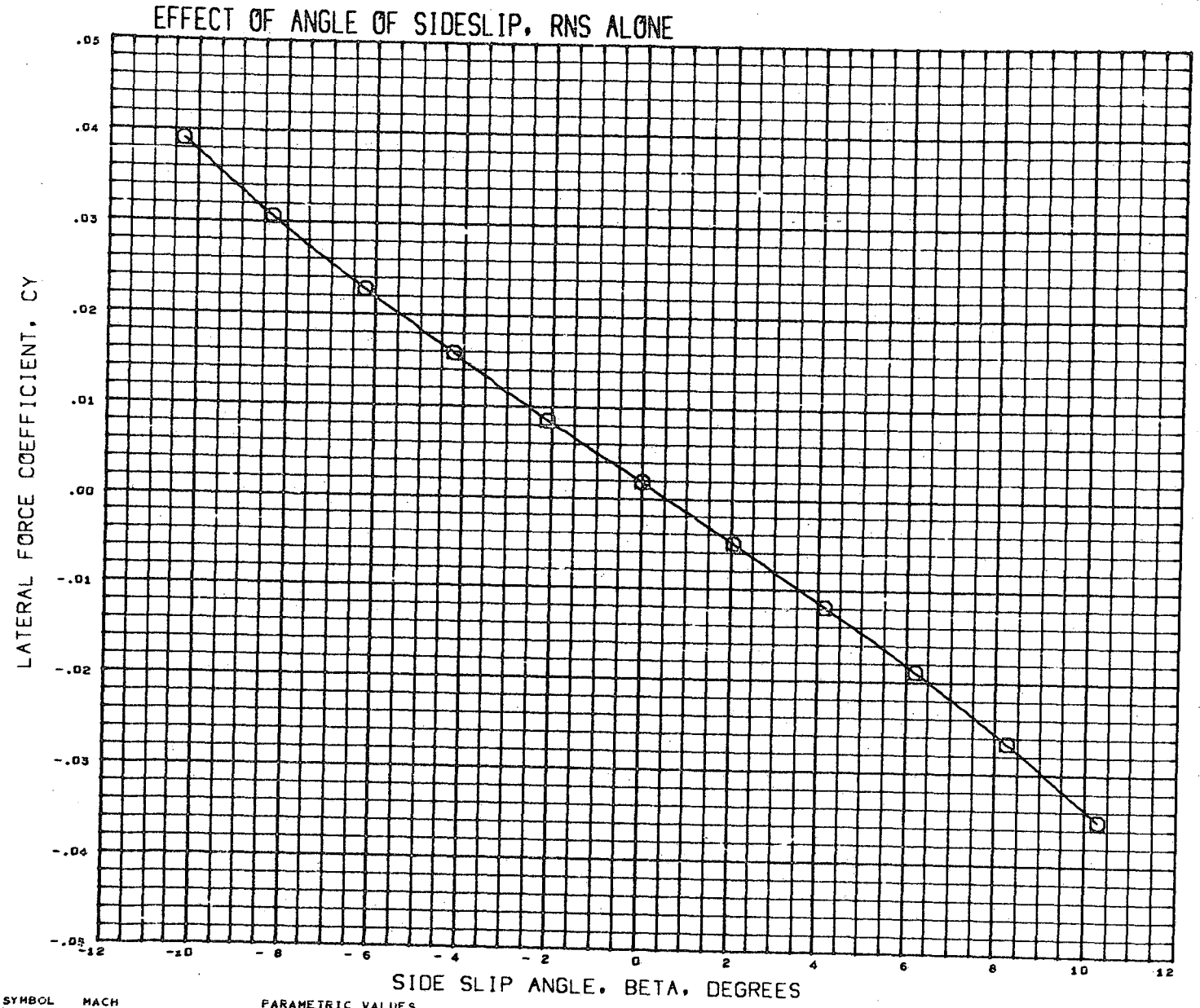
SYMBOL MACH PARAMETRIC VALUES

O 0.604 ALPHA - 6.000 GRIT 54.000

DATA HIST. CODE M*E

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP -	1.3320	INCHES
SCALE	0.0031	SCALE



SYMBOL MACH PARAMETRIC VALUES

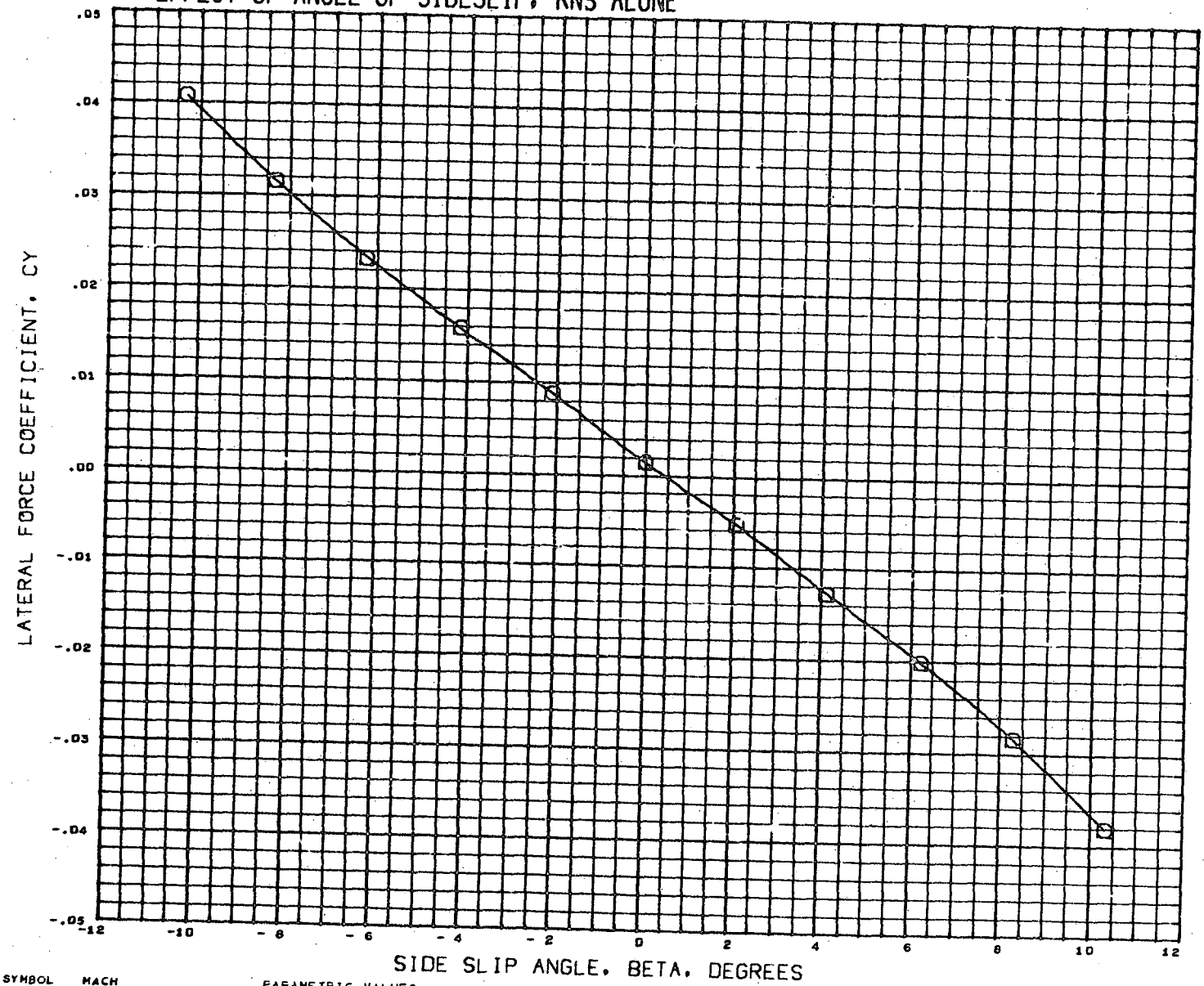
O 0.954 ALPHA - 6.000 GRIT 54.000

DATA HIST. CODE M*E

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP -	1.3320	INCHES
SCALE	0.0031	SCALE

EFFECT OF ANGLE OF SIDESLIP, RNS ALONE



SYMBOL	MACH	PARAMETRIC VALUES			
O	1.003	ALPHA	- 6.000	GRIT	54.000

DATA HIST. CODE M*E

REFERENCE INFORMATION

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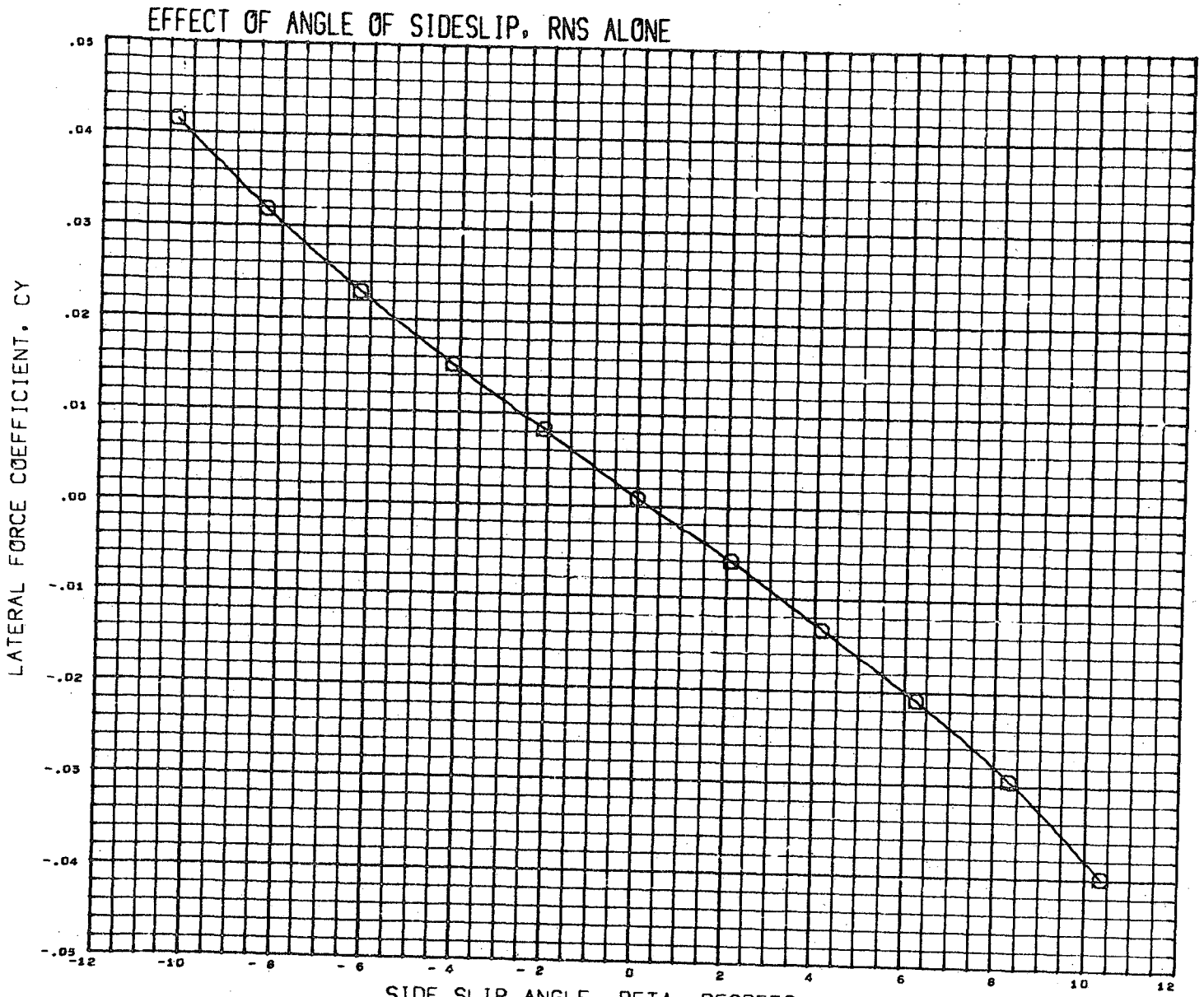
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP -	1.3320	INCHES
SCALE	0.0031	SCALE



SYMBOL MACH PARAMETRIC VALUES

O 1.196 ALPHA - 6.000 GRIT 54.000

REFERENCE INFORMATION

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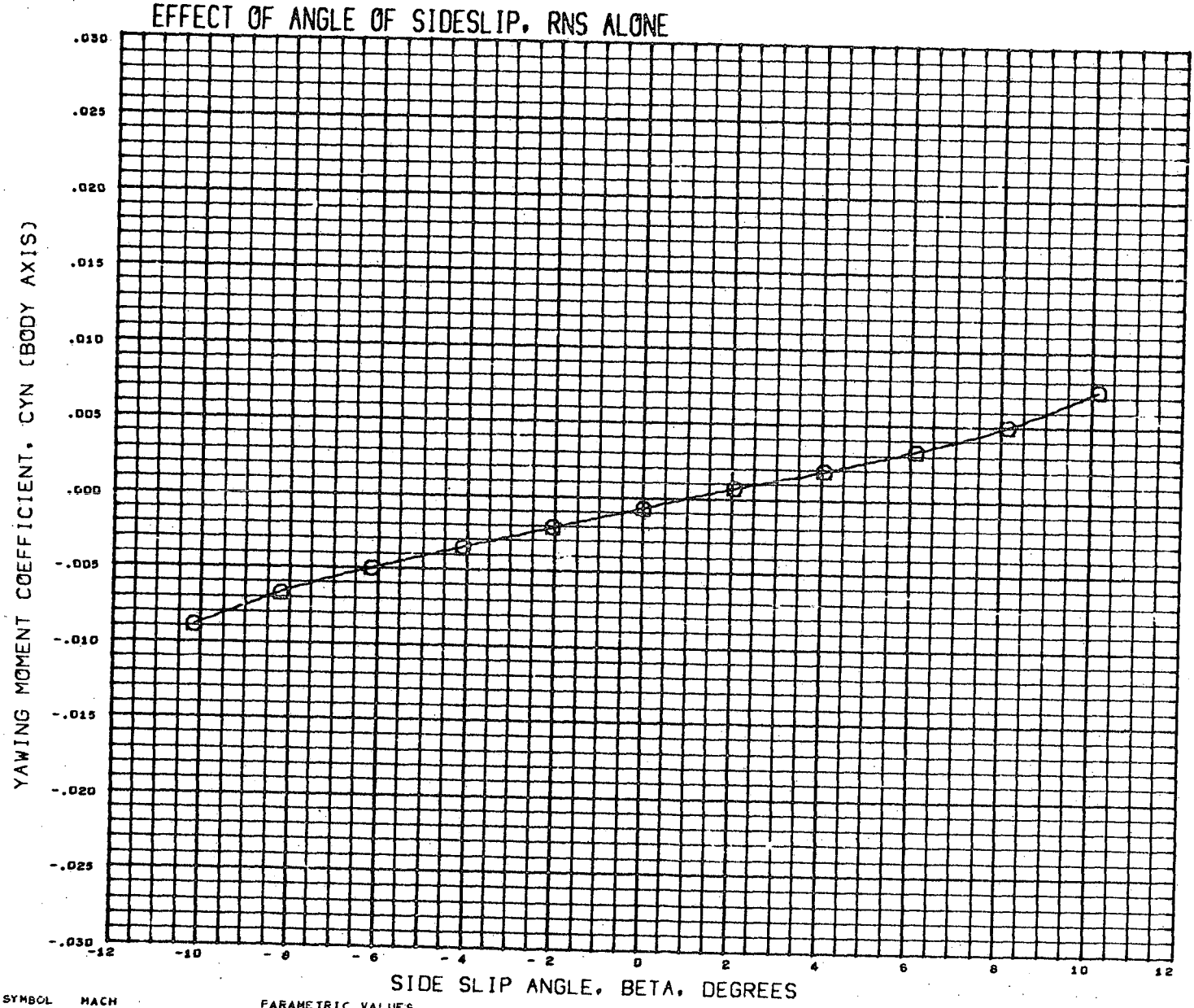
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP -	1.3320	INCHES
SCALE	0.0031	SCALE

DATA HIST. CODE M*E



SYMBOL MACH PARAMETRIC VALUES

O 0.604 ALPHA - 6.000 GRIT 54.000

REFERENCE INFORMATION

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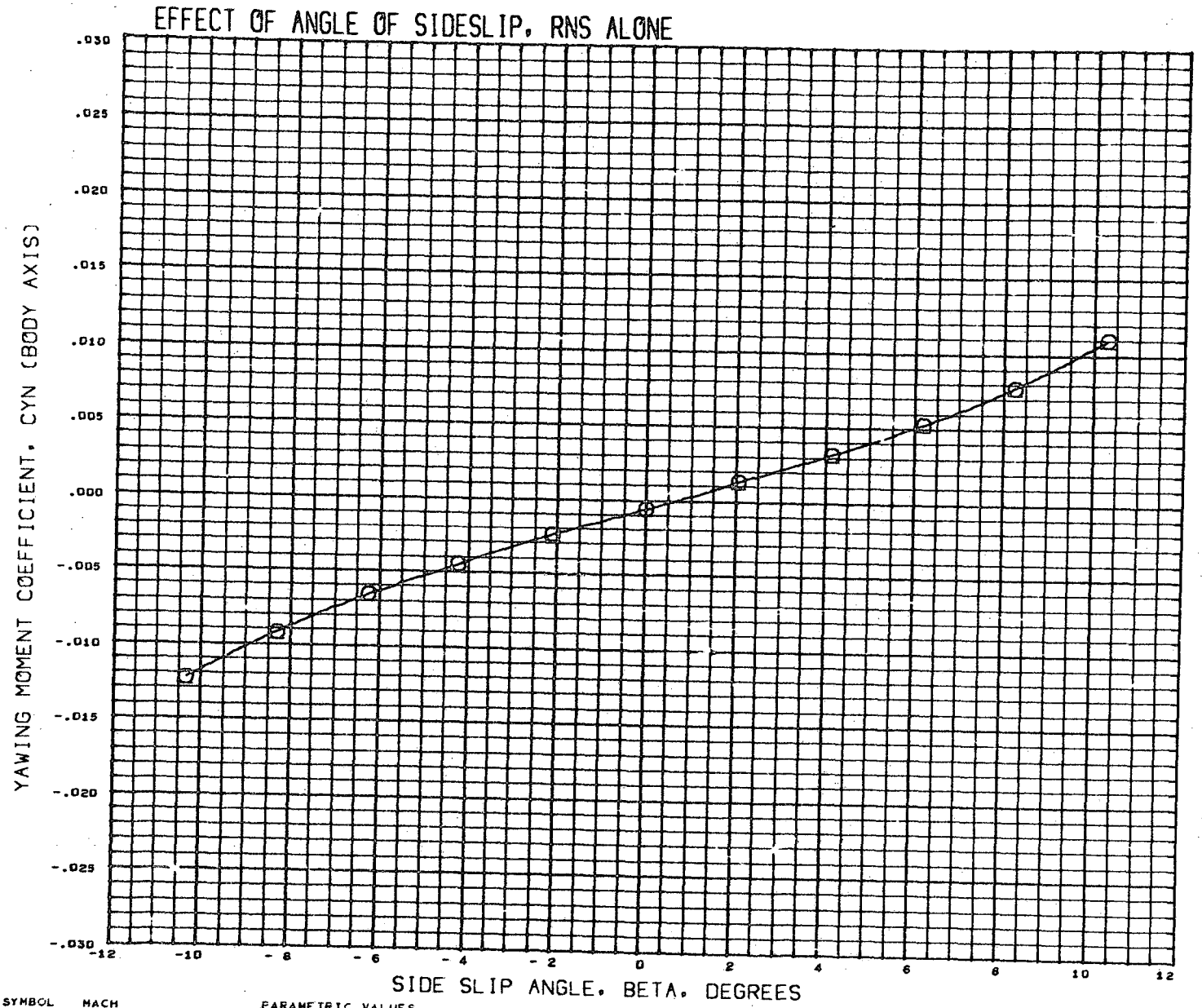
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP -	1.3320	INCHES
SCALE	0.0031	SCALE

DATA HIST. CODE M*E



SYMBOL MACH PARAMETRIC VALUES

Q 0.954 ALPHA - 6.000 CRIT 54.000

REFERENCE INFORMATION

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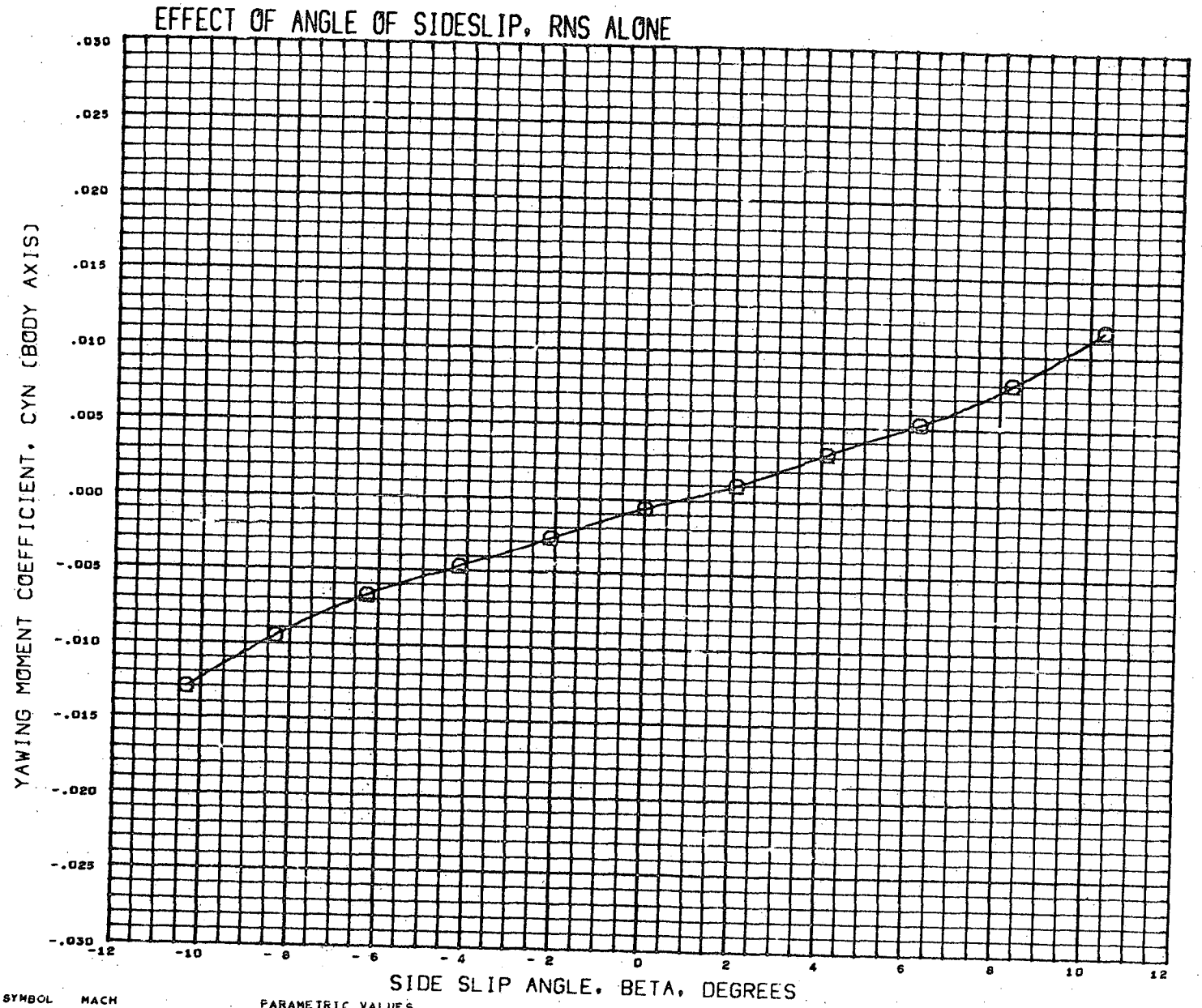
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP -	1.3320	INCHES
SCALE	0.0031	SCALE

DATA HIST. CODE M*E

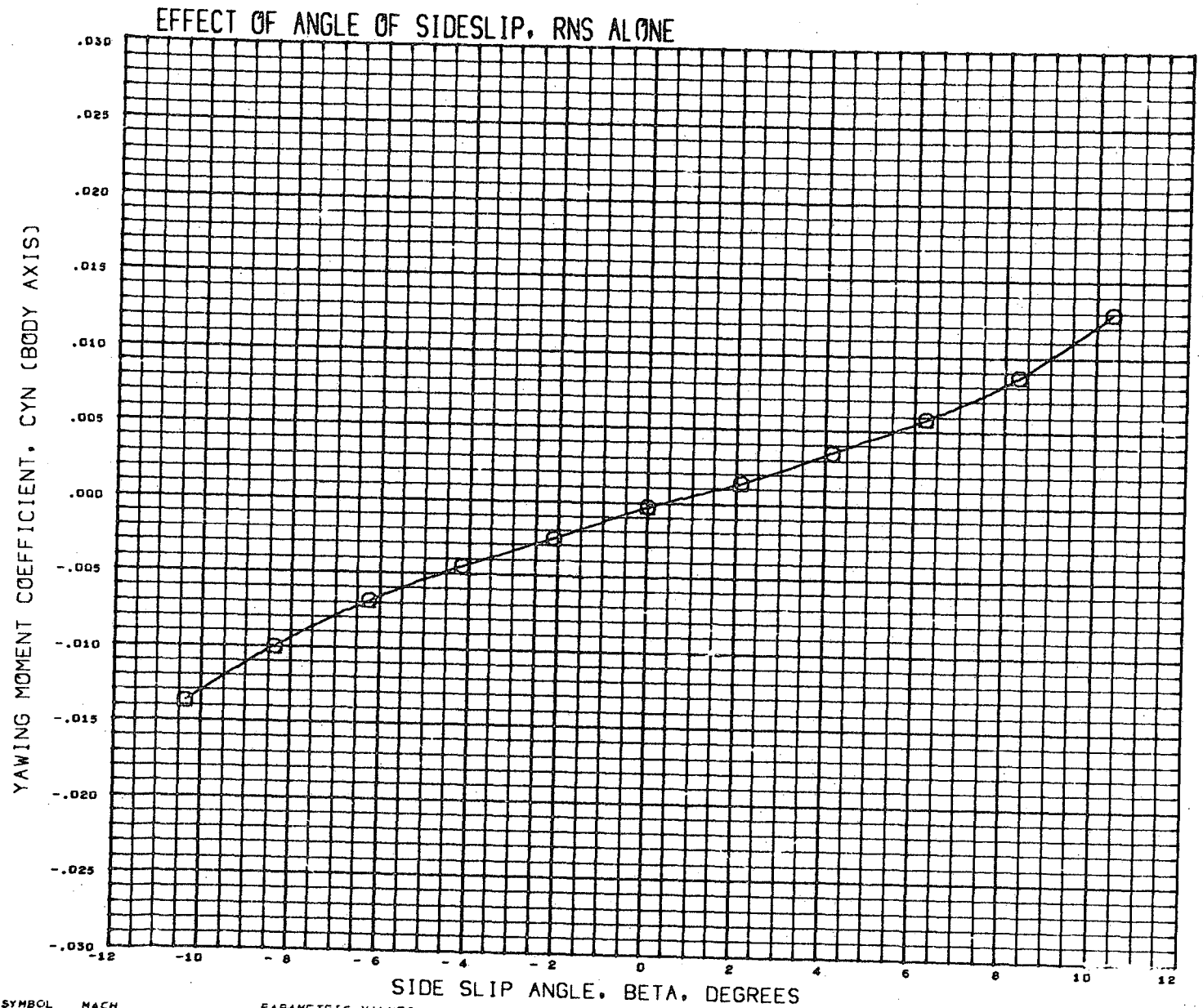


SYMBOL	MACH	PARAMETRIC VALUES			
O	1.003	ALPHA	- 6.000	GRIT	54.000

DATA HIST. CODE M*E

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP	- 1.3320	INCHES
SCALE	0.0031	SCALE



SYMBOL	MACH	PARAMETRIC VALUES			
O	1.196	ALPHA	- 6.000	GRIT	54.000

DATA HIST. CODE M#E

REFERENCE INFORMATION

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LREF	3.0950	INCHES
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XMRP	1.5610	INCHES
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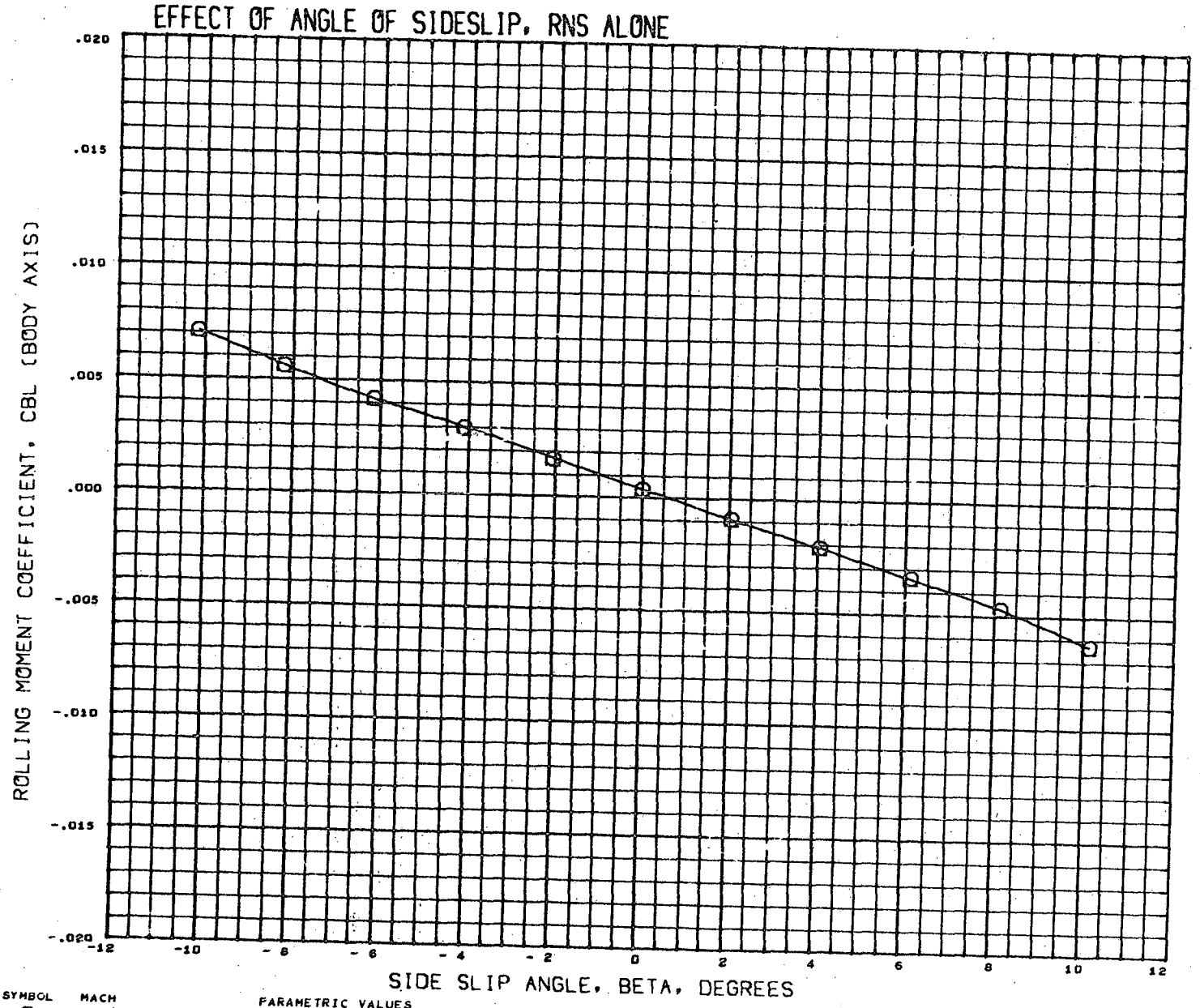
SCALE	0.0031	SCALE



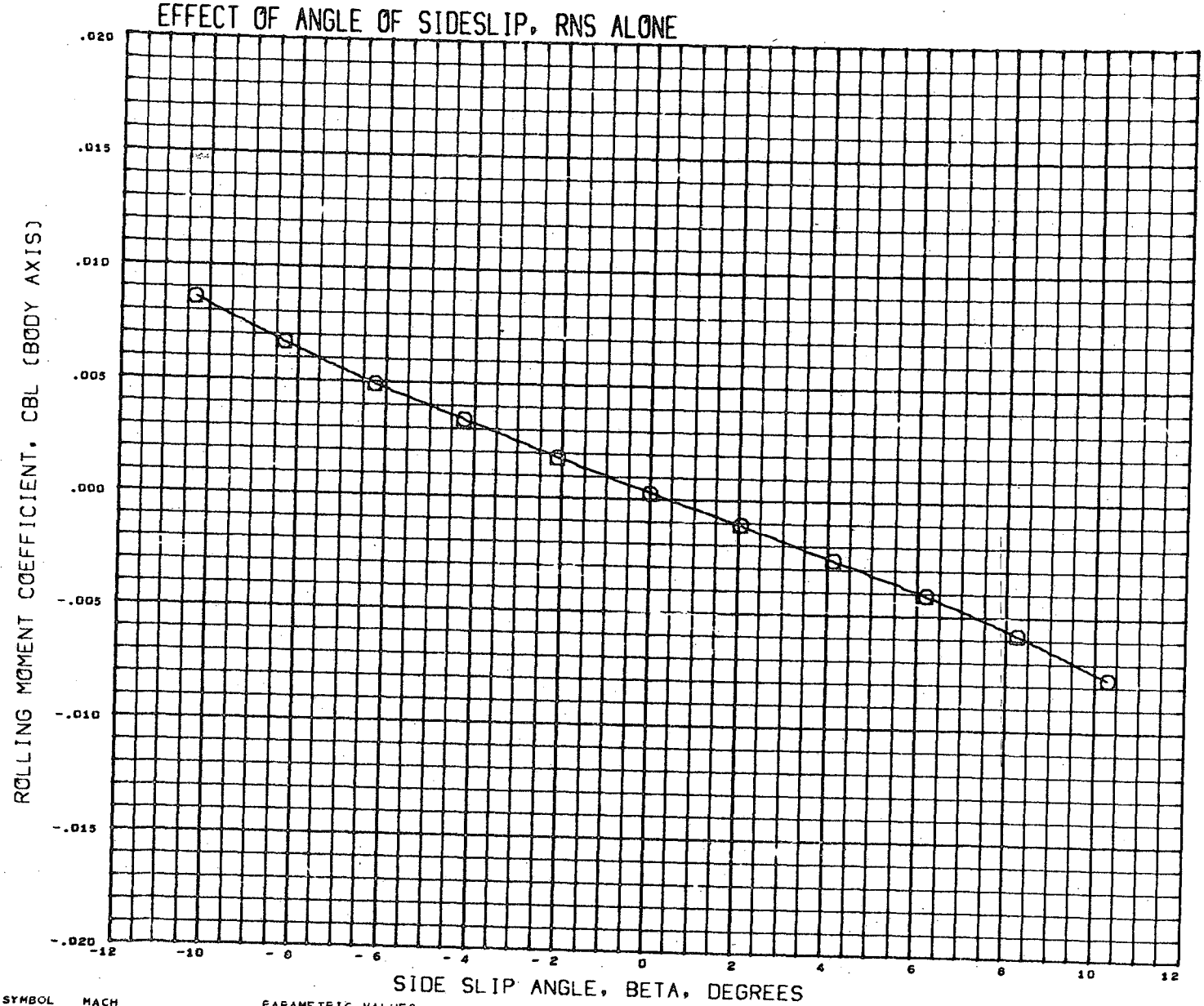
SYMBOL MACH PARAMETRIC VALUES

O 0.604 ALPHA - 6.000 GRIT 54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP	- 1.3320	INCHES
SCALE	0.0031	SCALE

DATA HIST. CODE M#E



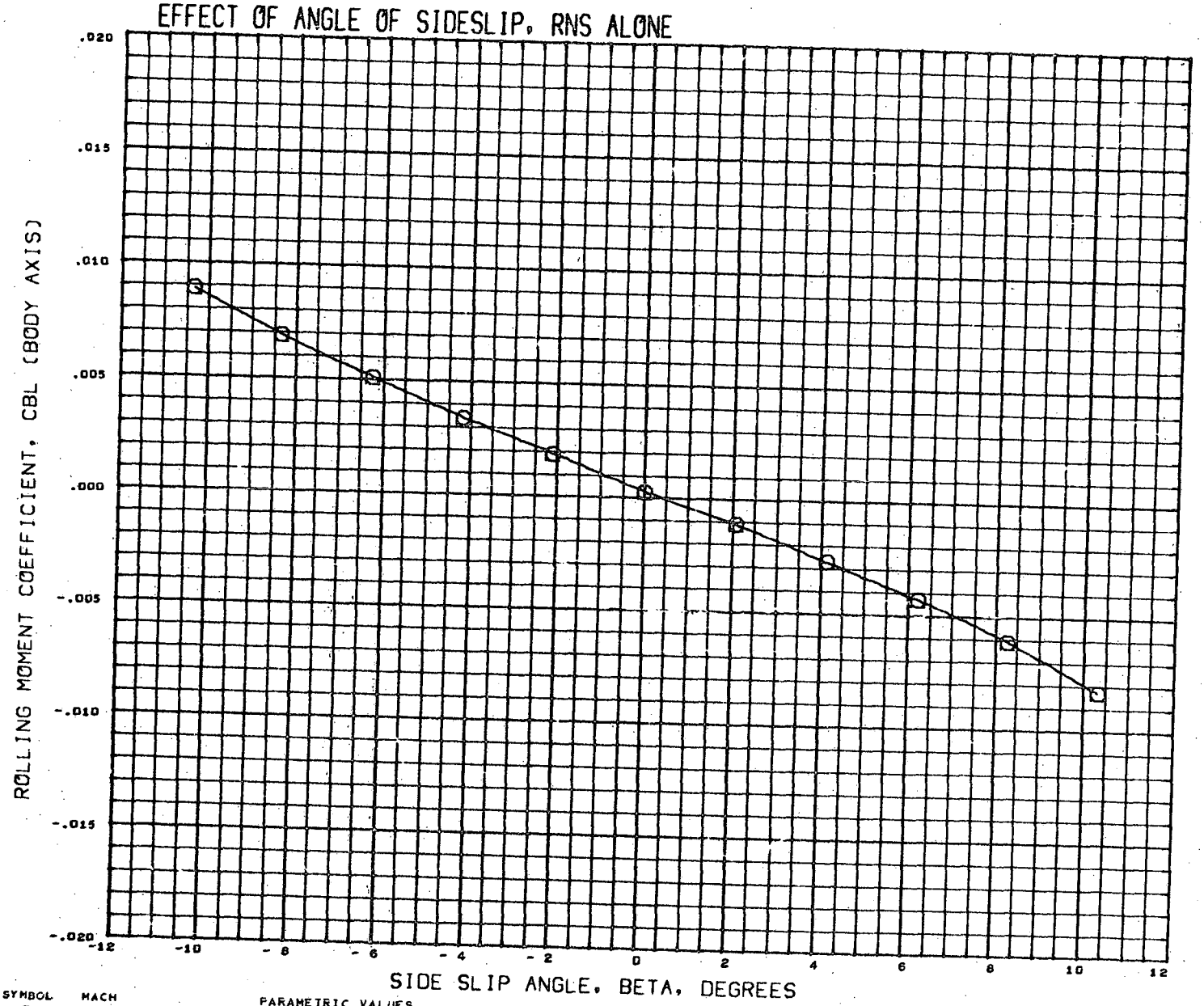
SYMBOL MACH PARAMETRIC VALUES

O 0.954 ALPHA - 6.000 GRIT 54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP -	1 3320	INCHES
SCALE	0.0031	SCALE

DATA HIST. CODE H*E

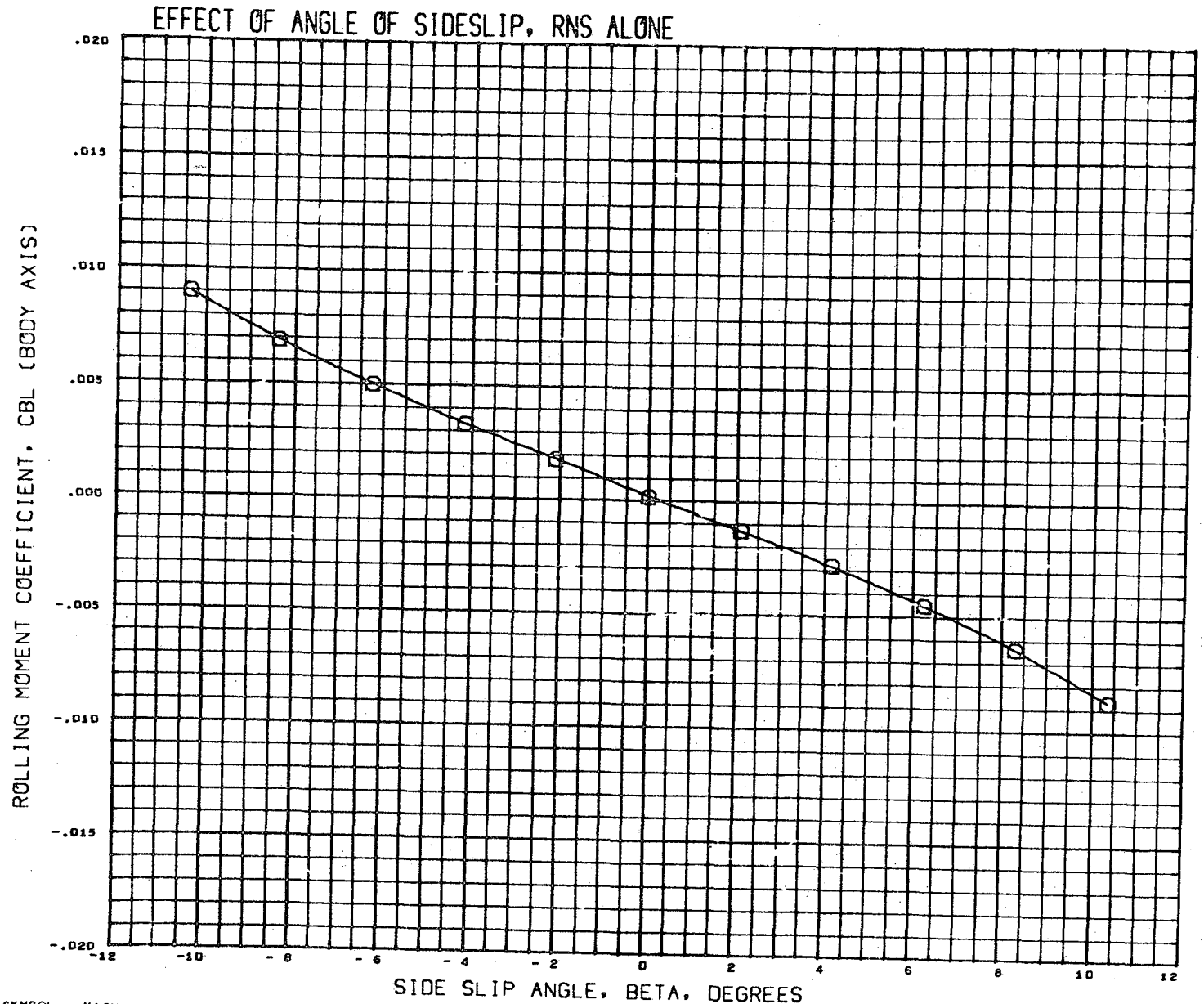


SYMBOL	MACH	PARAMETRIC VALUES			
O	1.003	ALPHA	- 6.000	GRIT	54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP -	1.3320	INCHES
SCALE	0.0031	SCALE

DATA HIST. CODE M*E



SYMBOL	MACH	PARAMETRIC VALUES			
O	1.196	ALPHA	- 6.000	GRIT	54.000

DATA HIST. CODE M*E

REFERENCE INFORMATION

SREF	15.6560	SQ IN
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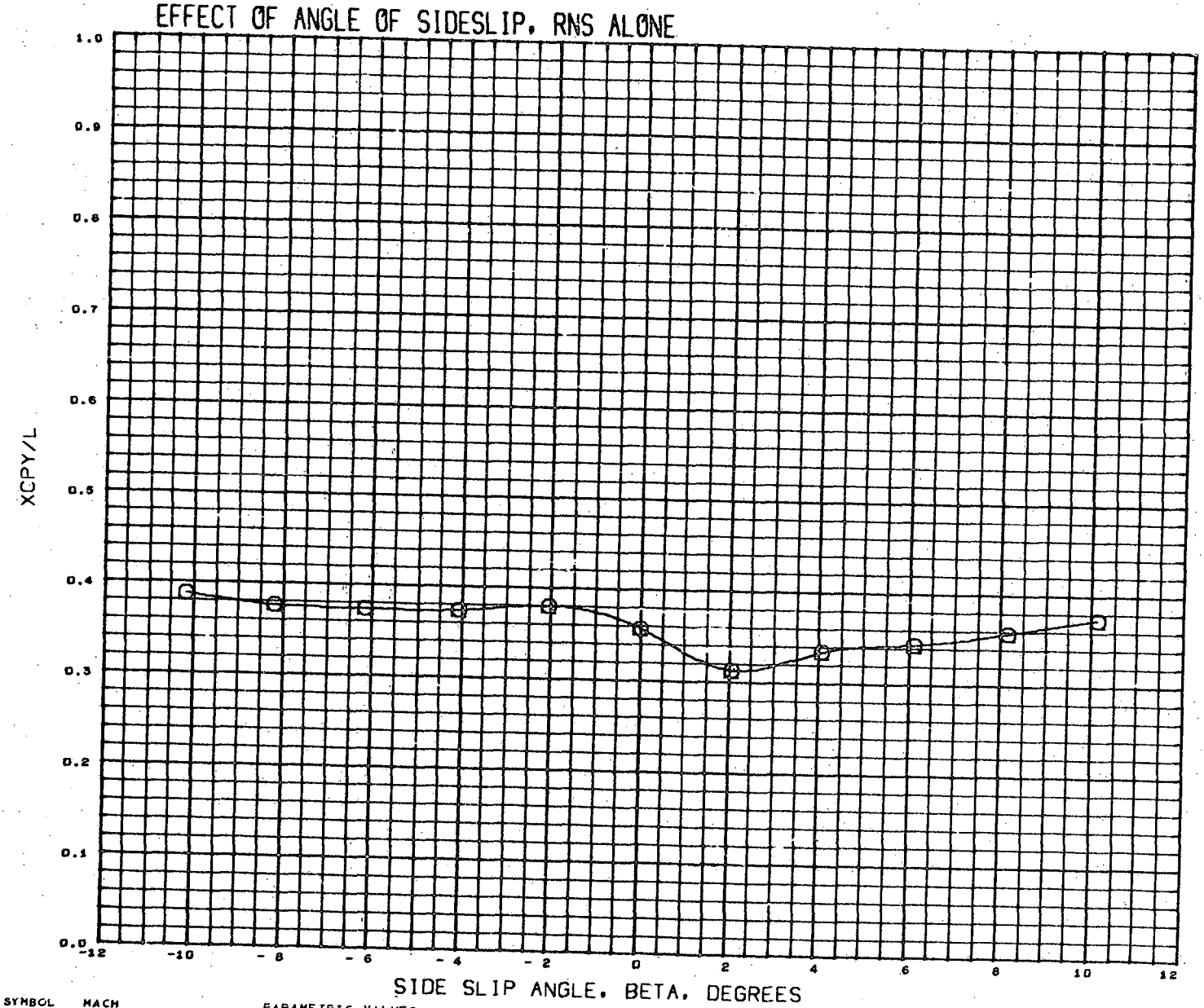
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP -	1 3320	INCHES
SCALE	0.0031	SCALE



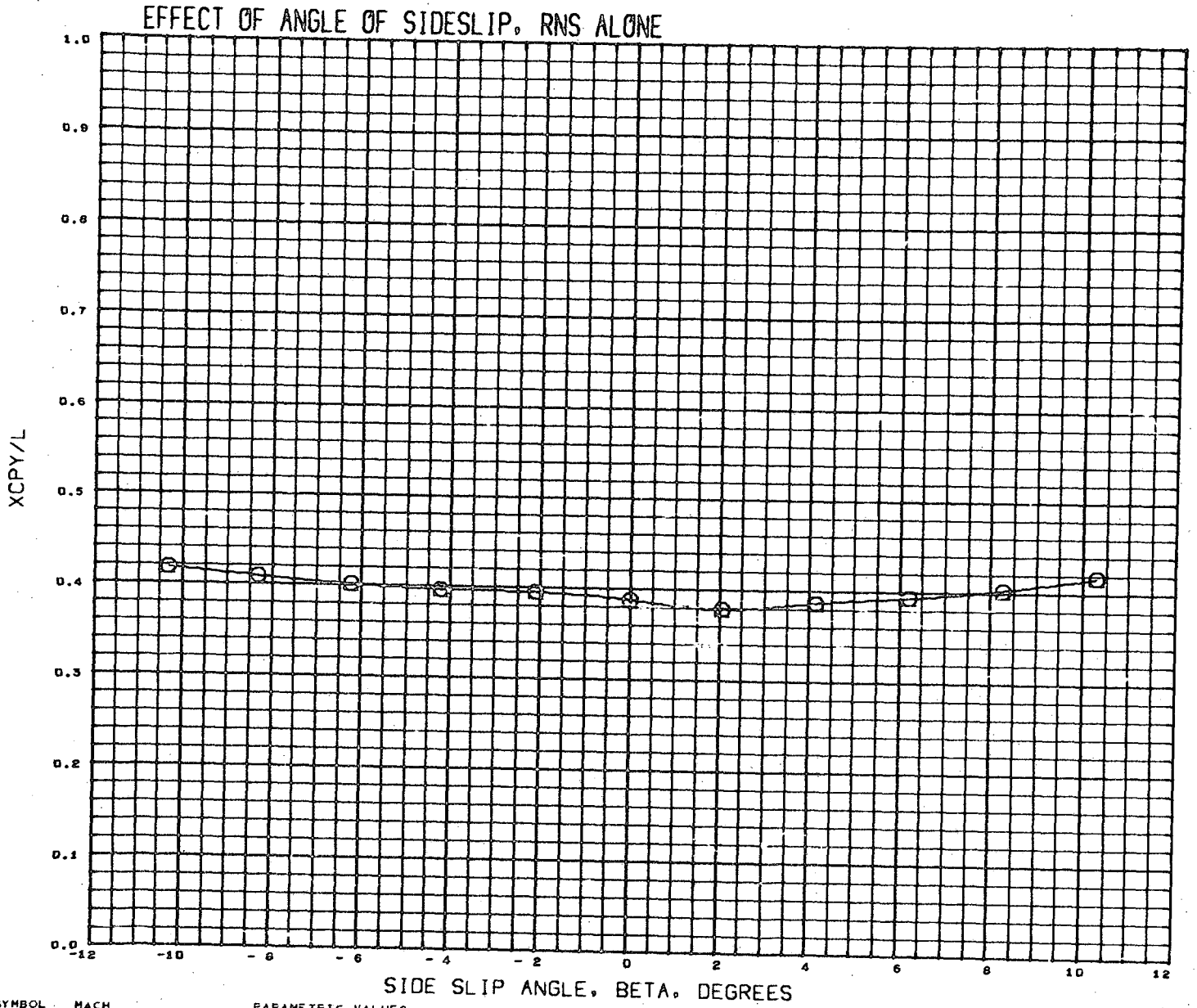
SYMBOL MACH PARAMETRIC VALUES

O 0.604 ALPHA - 6.000 GRIT 54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP -	1 3320	INCHES
SCALE	0.0031	SCALE

DATA HIST. CODE M*E



SYMBOL MACH PARAMETRIC VALUES

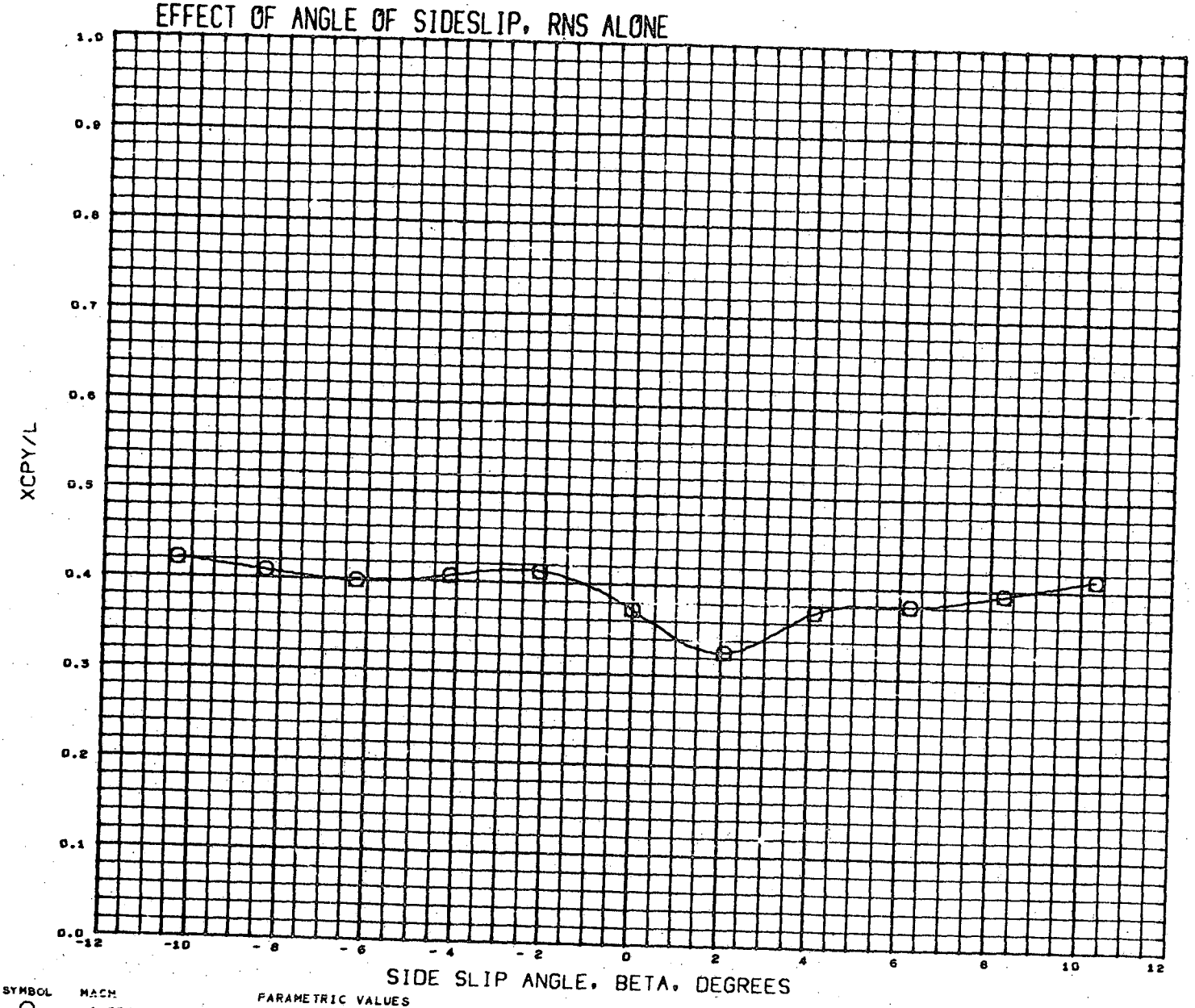
O 0.954 ALPHA - 6.000 GRIT 54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRF	1.5610	INCHES
YMRP	0.0000	
ZMRP -	1.3320	INCHES
SCALE	0.0031	SCALE

DATA HIST. CODE H*E

MSFC497 NR REUSABLE NUCLEAR STAGE RNS (C3913B) 28 AUG 71 PAGE 173



SYMBOL MACH PARAMETRIC VALUES

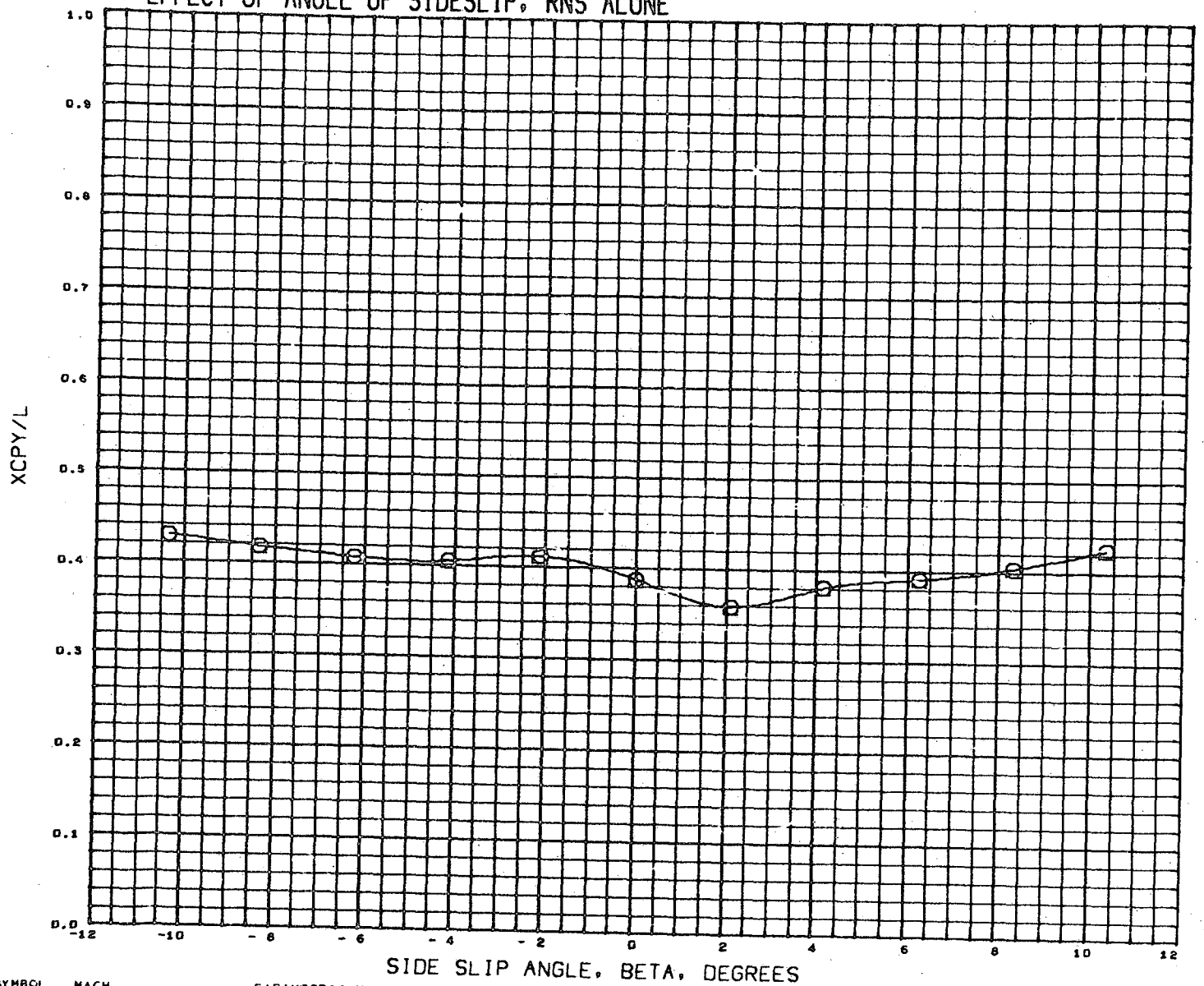
Q 1.003 ALPHA - 6.000 GRIT 54.000

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP -	1.3320	INCHES
SCALE	0.0031	SCALE

DATA HIST. CODE M*E

EFFECT OF ANGLE OF SIDESLIP, RNS ALONE



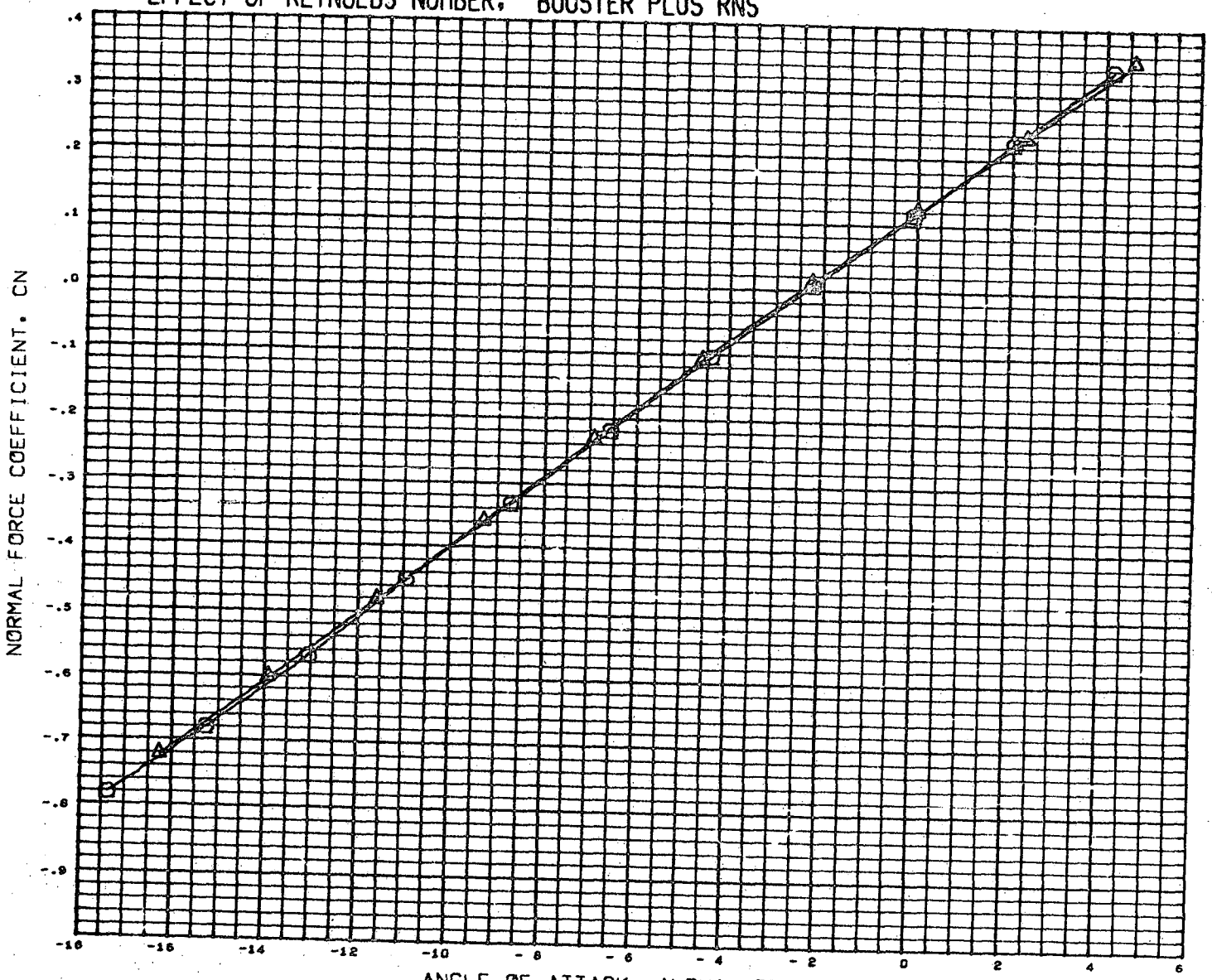
SYMBOL	MACH	PARAMETRIC VALUES			
O	1.196	ALPHA	- 6.000	GRIT	54.000

DATA HIST. CODE M*E

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	1.5610	INCHES
YMRP	0.0000	
ZMRP -	1.3320	INCHES
SCALE	0.0031	SCALE

EFFECT OF REYNOLDS NUMBER, BOOSTER PLUS RNS

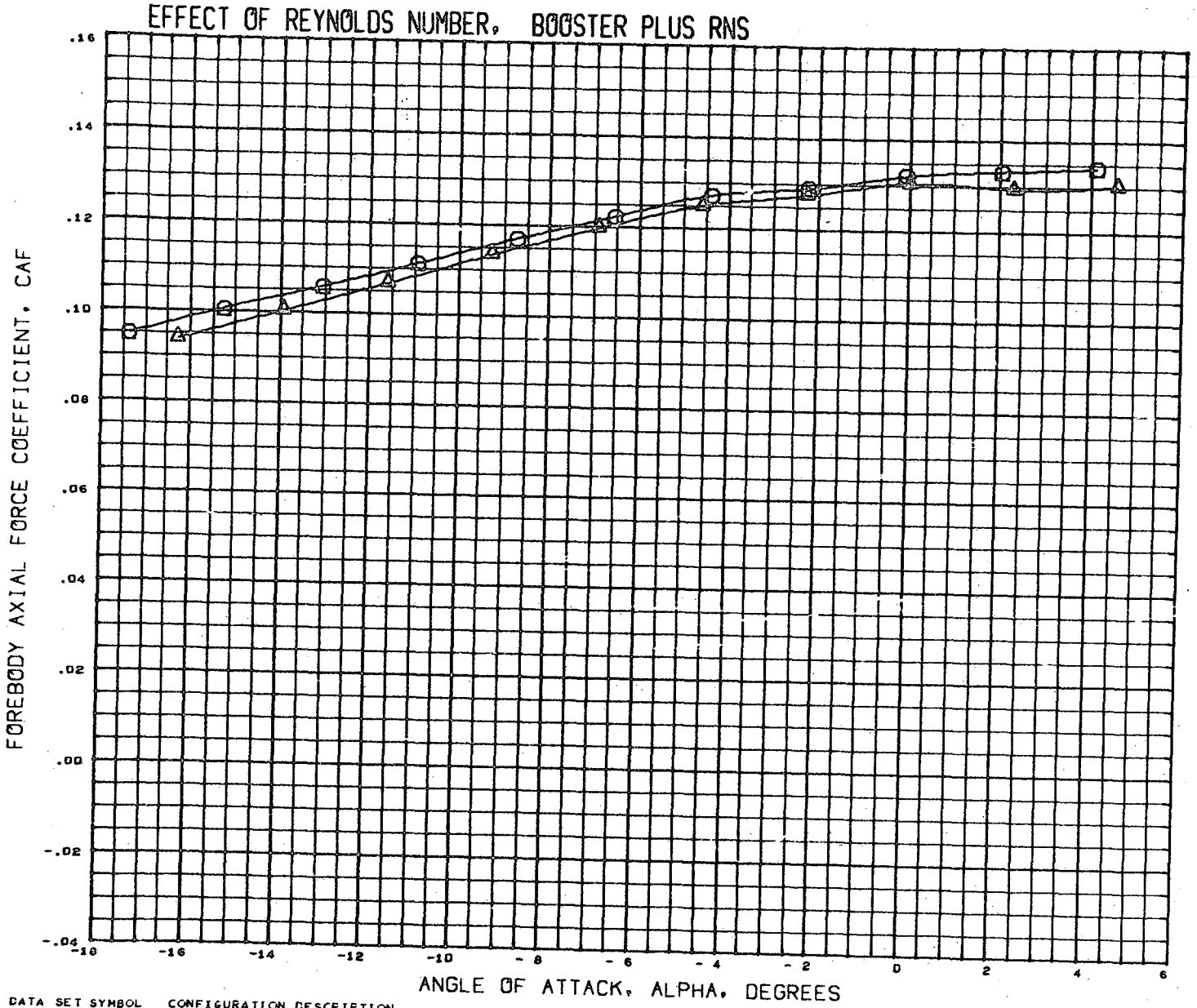


DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	GRIT	RN/L
(C3907A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	54.000	6.500
(A3912A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	54.000	12.400

MACH 1.194

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE



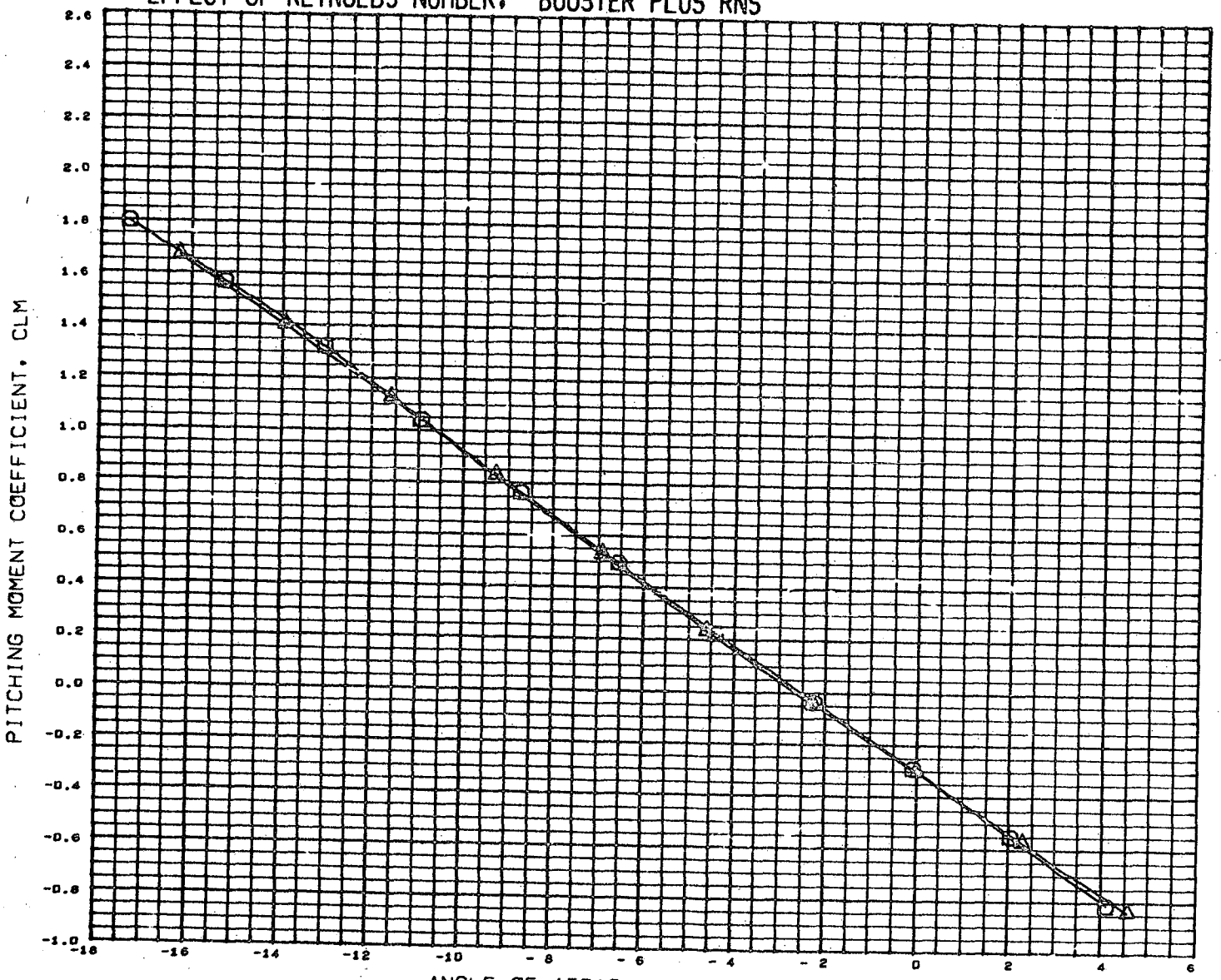
DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	GRIT	RN/L
(C3907A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	54.000	6.500
(A3912A)	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	54.000	12.400

MACH 1.194

REFERENCE INFORMATION

SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE

EFFECT OF REYNOLDS NUMBER, BOOSTER PLUS RNS



DATA SET SYMBOL		CONFIGURATION DESCRIPTION	BETA	GRIT	RN/L
(C3907A)	○	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	54.000	6.500
(A3912A)	△	MSFC497 NR/GD RNS LAUNCH B19W14C4AV7 + RNS	0.000	54.000	12.400

MACH 1.194

REFERENCE INFORMATION		
SREF	15.6560	SQ IN
LREF	3.0950	INCHES
BREF	6.0990	INCHES
XMRP	0.0000	
YMRP	0.0000	
ZMRP	0.0000	
SCALE	0.0031	SCALE